Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER AND AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 65 NEW YORK, SATURDAY, JANUARY 23, 1915 No. 4

Our Commercial Section

IN this issue we publish a larger number than usual of articles relating to the sale of electrical apparatus and electrical energy grouped in a department designated as the "Commercial Section." These articles will be found particularly interesting to all persons wishing to acquire accurate information concerning those methods of merchandising electrical supplies and appliances which have proved successful in various parts of this country and abroad, as well as to engineers who are called upon to design, install or maintain wiring, lighting and similar equipments in homes, offices, etc. Business methods and business principles will be dwelt upon for the benefit of jobbers, dealers and contractors and the commercial and illuminating engineers of central stations. Merchandising activities in the electrical field will be covered adequately and accurately. This department will be conducted in such a manner as to stimulate the interest in all classes of apparatus and appliances the use of which will tend to cause electric service to be looked upon as an every-day necessity by the general public. The "Commercial Section," which is published in each week's issue of the ELECTRICAL WORLD, will appear in greatly enlarged form in the fourth issue of each month.

Concentric Wiring

TO work effectively for the small consumer and to make him a paying investment it is necessary so to minimize the costs per service and increase the density of service as to recoup the station for its investment in the distribution system. An effective wiring campaign is part of the necessary program for obtaining small business, and in order that this should be successful the costs of wiring must be decreased to an irreducible minimum. Abroad, as has often been explained in these columns, a great deal is being done along this very line, and progress has been much helped by the remarkably cheap schemes of wiring especially familiar on the Continent. When an American engineer first examines the concentric-wire or twisted-conductor installation he is forcibly impressed with its simplicity. After making careful inquiry among those who actually have had first-hand experience in the matter for a considerable time, he begins to realize that methods are to be judged by their results as well as by their costs. Concentric wiring is looked at rather askance as yet in our own country. It doubtless has its faults, which exponents of other and more familiar wiring material are not bashful in explaining. The point of the matter is that concentric wiring and similar cheap wiring devices must be taken seriously, first because they have already proved satisfactory on a considerable scale in foreign practice, and secondly because they point the way toward making electric service emphatically a necessity instead of a luxury, and this very thing is what may help to save the central-station business in the future. As improvements in lamp efficiency continue, making every kilowatt-hour sold do increased duty in results, the importance of universal electric service with all the possible outlets for energy becomes more evident. It is imperative, therefore, that concentric and other simplified and cheapened forms of wiring be put to service test.

Choking American Enterprise

THERE is a volume compressed in the few words which account for the diminished output of the Niagara Falls Power Company last year, given on page 255. That great enterprise, which has meant so much to the electrical industry and also to the industrial welfare of New York State, has been constantly harassed not only by the State itself but by the federal government as well. For some unaccountable reason the federal government seems to be more solicitous for people other than its own, because it not only checks development on the American side of the falls but stipulates exactly how much electric power can be imported into the country from Canada. The demand for Niagara energy in New York State has been greater than the supply, with the result that American industries have been forced over the border into Canada, where their electrical needs could be met. Sentimentalists will, of course, contend that no private enterprise shall be permitted to detract from the majesty and grandeur of Niagara Falls, entirely oblivious of the fact that the roar of the mighty cataract is as nothing compared to the hum of the innumerable industries kept in motion by the energy wrested from its water.

Foreign Trade Promotion

THE second National Foreign Trade Convention, held in St. Louis this week, gave forceful expression to the needs of exporters. The results will benefit electrical manufacturers in common with other manufacturers. As we have interpreted it before, the National Foreign Trade Council is the public policy committee in export trade. A number of the largest manufacturers in the country, including electrical manufacturers, are members. Many others were represented by

delegates. The council is trying to remove legal, governmental and private obstacles to foreign trade, and it finds wholly unnecessary difficulties. To put the difficulties before the public clearly will certainly promote popular understanding and further that wholesome, constructive governmental attitude which is so essential. A single industry acting alone would be open to the charge of self-seeking. So large and representative a group of the greatest industries of the country as is found in the council bases its great movement on the commercial interest of the entire nation and will not be denied a hearing.

Iron Conductors

A brief note abstracted for our Digest from the *Elektrotechnische Zeitschrift* brings to the front the somewhat unfamiliar idea of using iron and steel wires for overhead conductors and even for other purposes. The effect of the war in cutting off the importation of copper from Germany has been considerable, just how great it is quite impossible to tell, but great enough to raise the question here discussed. Tests made both for direct current and alternating current have shown that in using relatively small wires with low-current densities the iron conductor can be made surprisingly effective, even for alternating currents, when the matter of cost is taken into account. So effective is it, indeed, that at a possible ratio between the cost of iron and that of copper conductors of the former material may pay well. It is only when the conductors are of the larger diameters and carrying considerable current that the serious effects of the change in material become conspicuous. While at home the cost ratio of iron as compared with copper is unfavorable, yet, if a recent quotation reported from Germany of $600 a ton be correct, the balance may well be turned in the other direction.

Accounting for Depreciation

Much progress has been made in accounting for depreciation. Many more companies are trying to provide for it than before the era of commissions. Commissions have made company officials realize the necessity of showing all elements of cost. When depreciation is a factor in the cost of service it is a factor in rate-making. If depreciation is not part of cost, an astute public can fairly argue that it need not be considered in rate-making. In the article published in this issue Mr. Cravath advises companies so to separate their accounts that estimated depreciation and the amount applied for replacements may be ascertained readily. In some cases this would involve an estimate of heavy accrued depreciation unprovided for, which it is unpleasant but wise to confront. If an established concern is bankrupt, it is not helped by piling fresh losses on the old losses. The first thing to do is to put the business on a sound basis, to create profits where losses grew, to face the fact that if all elements of cost are considered some apparent profits did not exist. What commissions have really done is to enforce depreciation accounts, to compel recognition. What companies should do is to apply knowledge, judgment and experience so that the accounts may be as close to requirements as fallible human nature can determine.

Direct Determination of Hysteresis Loops

In measuring the hysteretic power loss within rings of iron or steel by the ballistic method, it is a common practice to vary the magnetizing force, or ampere-turns, on the ring by successive steps, observing the corresponding ballistic galvanometer deflections, until the maximum desired ampere-turns are reached, and then to retreat by similar steps through zero to the full negative value, again returning to zero, and so on through each cycle. If a number of such steps are followed, it is quite likely that the sum of the steps of magnetic induction recorded for the ring in the positive direction is distinctly different from the corresponding sum in the negative direction. This means that the hysteresis loop appears to be dissymmetrical and will not close up—a result which is apt to have a depressing effect after much experimental and arithmetical effort.

A well-known method of avoiding the above mentioned discrepancy consists in bringing the ampere-turns on the steel ring back each time to the full maximum value in, say, the positive direction, and to take successive steps of increasing magnitude from that extreme value up to the full negative maximum. One method of carrying out this plan is to employ two windings on the ring, one excited permanently and the other by steps in the reverse direction. In an article by Mr. Arle Ytterberg on page 212 is described a simple modification of the plan employing two rheostats with but a single winding. Equivalent single-winding methods have indeed been used before, but the particular arrangement described in the article has certain advantages in technique.

Capital for Cincinnati

In negotiations with the City Council on rates the Cincinnati Gas & Electric Company has raised the insistent question that no public utility can dodge—the supply of fresh capital for extensions. The old public idea was that if a utility were started its capital was sunk, the community could do what it liked, and service would be furnished forever thereafter. This was short-sighted, and it ignored altogether the unexpected large growth of both communities and properties. The original investment is sunk, it is not recoverable, but the problem is to get additional capital for a live, developing community. Just how seriously this has been accentuated by the fearful destruction of people and capital in Europe cannot be known. When the Cincinnati company plans to spend $15,000,000 within twenty years, a large part of which will be in the next five years, it is definitely certain that it will have to compete with borrowers from Europe and from other countries previously financed by Europeans. Whether this competition will

affect the price bankers pay, or the interest rate of the bonds, or both, and whether an influence will be for five or twenty years, are immaterial in comparison with the fact that we shall do more of our own financing and depend less on the peasant thrift of Europe. Cincinnati cannot expect investment in its utilities unless it allows rates that permit, not a living return, but a return that shall attract capital from other ready borrowers.

Fixtures for Gas-Filled Lamps

The arrival of a new illuminant always disturbs the normal progress of affairs not only in the source of light itself but in all the accessories that go with it. The gas-filled lamp has come to stay. Perhaps in the smaller sizes it may not fulfil all the expectations of its friends, but certainly as a powerful source of light it is a valuable addition to the resources of the illuminating engineer. The high degree of incandescence which characterizes it has, however, its embarrassing features, since it makes thorough screening more than ever necessary. The ordinary tungsten lamps, it is true, require for most uses pretty thorough screening, but they can be endured under circumstances which would be quite intolerable with the gas-filled lamp; hence there is need of proper fixtures and shades for the newcomer. The difficulty is that in the gas-filled lamp the filament is placed in a position within the bulb totally different from that occupied by the filament in ordinary tungsten lamps of similar candle-power. The result is that no substitution of the gas-filled for the ordinary lamp can be made without a corresponding change in the accessories.

The use of gas-filled lamps within doors is not yet common, but it is going to be so, and the same difficulty in substitution arises in a very acute form. The fact that at present the new lamps must be used with the socket at the top is a serious hindrance to their adaptation to many fixtures, such as to many ball fixtures and ornamental bowls adapted for semi-indirect lighting. In fact, so far as semi-indirect lighting is concerned, an entirely new line of fixtures must be used with gas-filled lamps, the important points being so to place the lamp with reference to the glassware that the brilliancy of the latter shall not be too high and that the shadow of the socket shall not be thrown on the ceiling. Moreover, owing to the fact that the socket is at the top, it is difficult adequately to conceal the lamp, and on most types of fixture, if anywhere nearly concealed, the filament is brought so low as to produce a bright spot. In semi-indirect work the color of the glassware cannot be ignored. Many materials used for this purpose have a slight degree of selective absorption, perfectly unobjectionable with the somewhat yellowish light of the ordinary tungsten lamp but injurious to the very quality of the gas-filled lamps which makes them for some purposes so valuable—that is, the much closer approximation of the light to white. Again, in indirect illumination the modification of color by the diffusing surfaces must be carefully attended to. A degree of tinting quite permissible with the ordinary tungsten is deleterious to the color values produced by its whiter rival. In fact, there is hardly a single illuminating accessory now regularly employed which does not require modification for employment with the gas-filled lamp.

To get the best results out of the highly concentrated and brilliant filament now available the shades will require no small amount of study. One advantage the concentration gives is the possibility of far more perfect focusing shades than have yet been available. Some capital work has already been done on headlamps and searchlamps with the new incandescent units, and one may reasonably hope for a group of commercial shades showing uniquely valuable properties for accomplishing certain difficult feats in illumination.

An Up-to-Date Central-Station Building

The office building which the Hartford Electric Light Company has recently erected as its local habitation well bears out the reputation of the company as a leader in every department of central-station activity. It is a very complete and dignified structure of concrete and steel, erected last year at a cost of about $300,000. It is five stories in height, accommodating the appliance and contract department on the first floor, offices on the next two stories, and the lighting department on the fourth, with storage space at present upon the fifth. The basement is used for heavy stock, the boiler plant and various other heavy equipment.

The lighting of the building is particularly effective, use being made of a very striking cornice equipment and four dignified lamp-posts at the front, each containing a 1000-cp gas-filled lamp. For the interior lighting use is made chiefly of the semi-indirect system with 400-watt lamps on the ground floor and 150-watt lamps as a standard in the offices above. Special attention has been paid to the equipment of the lighting department, which contains facilities for testing under service conditions any alternating-current or direct-current meter, and in addition a storage battery to give any voltage from that of a single cell to 129 volts, which is the highest working pressure. A well-equipped photometer room and a large fireproof lamp rack for life tests were also provided for the working activities of the lamp department.

Another admirable equipment is a motor-testing apparatus consisting of a modified Prony brake capable of giving closely adjustable and steady loads for testing motors of any rating up to 75 hp. A machine shop with individual motor drives gives adequate facilities for all the lighter construction and repair work which has to be done. A well-equipped lecture room, a very complete electric-cooking outfit and quarters for recreation purposes are also provided. Altogether the new building forms a remarkably useful and suitable home for a company which has always stood in the front rank of efficiency.

LETTERS TO THE EDITOR

Cheap House Wiring

To the Editor of the ELECTRICAL WORLD:

SIR:—I note with considerable satisfaction the favorable discussion that is taking place on the subject of cheapening the system of house wiring.

A few years ago, when the movement for permanent grounding of secondary distributing lines was slowly reaching a substantial footing, many "doubting Thomases" came forward with adverse criticism, but the members of the National Board of Fire Underwriters were apt scholars in this instance, and where grounding was once prohibited it was first permitted and finally recommended. Grounding the neutral point of three-wire Edison systems to water mains has been common practice for several years, and central-station managers quickly realized the benefit in the reduced copper investment, the absence of static disturbance and the elimination of dangerous voltage due to crosses between wires.

The present movement for bare concentric wiring represents merely a natural step in the general progress. With the secondary system permanently grounded and with mandatory grounding of the bare wire on the customer's premises, little of advantage could be sacrificed by its introduction. To be sure, it will involve a question of polarity of the same importance in both direct-current and alternating-current systems, but the inconvenience will be trifling when compared with the reduction in the cost of installation.

D. A. COURSE,
Wamego, Kan. *Superintendent Light and Water Plant.*

To the Editor of the ELECTRICAL WORLD:

SIR:—Although an electrical contractor, I am unable to understand why the electrical contractor or the manufacturer objects to the introduction of the proposed cheap European method of wiring small buildings in locations where it is now impossible to introduce electric service by reason of the expense. The N. E. L. A. committee on the wiring of existing buildings, of which I am a member, has given the subject considerable study for almost two years. An investigation showed that in European countries where the cheap wiring is employed the percentage of loss by fire is only one-twentieth of that in this country. The cheaper wiring will be used only in small installations as a neat and cheap substitute for wooden and metal molding. It will not be used in fine apartments and residences where concealed circuits are now employed.

It is not to be expected that the introduction of the cheaper wiring systems will cause a diminution in the amount of wiring done by present methods. On the contrary, its introduction will result in a great stimulus to the older methods as well as to the new. It will open up to the central stations and wiring contractors an immense field not now covered on account of the extra expense of the present methods.

It seems to me that the objections of the contractors to the cheaper wiring systems are about as reasonable as would be the objections to the use of a Ford car by those who cannot buy a Packard.

Brooklyn, N. Y. GEORGE WEIDERMAN.

To the Editor of the ELECTRICAL WORLD:

SIR:—Inexpensive wiring systems have been discussed in the electrical press for years, and also in the reports of the National Electric Light Association. It is hard to see why there should be any objection to such improvements in the art, especially when they are as safe as, and in many ways safer than, present methods. If the new methods were likely actually to cause the displacement of any large investment in tools or make any large stock on hand unavailable, then there would be reason for taking into consideration the vested interests. In case of the concentric wiring it will be several months, or possibly a year, before the new wire and fittings can actually be placed on the market. Moreover, there will be no broad patents to interfere with the general manufacture of the wire by any maker, although there may be secondary detail patents on some of the fittings. It is to be expected that the concentric wire will be used in installations where the more expensive systems would not be employed. The stimulus to the industry, and the increased use of electricity everywhere as a result of the spreading of its use into the smaller houses and among the class of people who can only pay small rents, will result in more work for everybody, rather than less.

There has been no desire on the part of anyone to "spring" a new plan on the public or to interfere with any business. The National Electric Light Association committee on the wiring of existing buildings asked more than one manufacturer to take up the matter with the Underwriters, and—as in the case of its action in plugs and receptacles—has been very careful not to commit itself in any way to any patented article.

The fact that a large sale for the new system and wire is expected by those opposing its introduction is a thorough proof of its desirability, especially when taken in connection with its extensive use abroad.

R. S. HALE,
Boston, Mass. *Chairman N. E. L. A. Committee on the Wiring of Existing Buildings.*

Weakness in Steel Towers

To the Editor of the ELECTRICAL WORLD:

SIR:—My attention was recently called to the failure of some steel poles carrying a valuable transmission line of a certain power company. I understand that these poles were constructed of shapes rolled from scrap high-carbon-steel rails, and it occurs to me that if this was a fact it may have caused the failure. There are poles on the market that are made of this material. Light angles for tower construction have also been rolled from scrap rails. There is absolutely no way of determining the value of stock rolled from this class of material without testing each individual rail, which would be impracticable. Steel of this character has been subjected to various heat treatments to bring it up to the standard required, but the heat treatment it receives in a scrap-reducing mill is crude and the cooling is governed by atmospheric conditions, the amount of water used on the finishing rolls and the thickness of the section.

The chemical analysis is also changed. When rolled in a thin section it cools quickly and becomes hard and brittle according to the amount of carbon contained, which amount is unknown. Hence the material is of unknown value and is treacherous in extreme cold and frosty weather. Most of the breaks in rails in railroad service occur during such weather. I have seen a section rolled from this material break like glass when run through straightening rolls. I believe that engineers would not consider seriously the use of shapes rolled from this class of material in the construction of steel bridges, buildings and other similar structures. It would seem unwise to use this material of unknown strength and chemical value in the construction of an

important and vital part of a valuable transmission line like a pole or tower, when such structures can be made of the best structural steel.

The use of poles, towers and other structures made of hard or bedstead angles for carrying valuable high-tension transmission lines is certainly dangerous. I believe there are some pole users that do not know that this class of material is being used for the purpose indicated. Various shapes are being rolled from scrap steel-car axles and used as a substitute for good structural steel. The price of car axles is not uniform, hence it is safe to assume that the quality and strength are not uniform. Any structure made from scrap steel rails or axles is one of unknown strength and value. Its strength cannot be accurately computed, hence users of poles and towers should insist upon the use of the best structural steel.

Franklin, Pa. B. HASKELL.

South American Business and America's Opportunity

To the Editor of the ELECTRICAL WORLD:

SIR:—At present practically all South American business, industries and mines are suffering because of the lack of supplies which formerly came from Europe. Germany, England and France, particularly Germany, controlled the lion's share of business. With the exception of a little from England, all supplies have ceased so that now a unique opportunity is presented to the North American manufacturer.

Now or never is the time for the American manufacturer to step into the South American market. With or without American mercantile marine and American banking facilities, the present is the best time ever presented, and probably the best that ever will be presented.

Much has been said about the great opportunities in South America, but they should not be overestimated. There are grand opportunities, particularly at this time of writing, for the reason that the past few months of the European war and the regular operation of several of the largest industries, works and mines, etc., have practically stripped the entire continent of supplies and other necessities.

The effective development of export trade by manufacturers with special reference to South America requires the co-operation of the banks, and probably the government, such as Germany had previous to the war. However, it is not the lack of banks and shipping facilities that has handicapped American manufacturers. The difficulty has been the insufficient knowledge of South American customs and the strong hold of European manufacturers and banks, particularly those of Germany.

German banks and manufacturers sent their best business men and engineers to South America to make studies of local conditions and co-operate with the most influential Latin-Americans and others of equally influential government standing to secure large electric light and power concessions, etc., or to develop existing business houses which they would finance and soon afterward literally own and operate themselves, so that all of the purchases of these houses afterward were made in Germany.

At present the rate of exchange in all South American republics is so high that it is almost prohibitive to remit money on goods as the purchase of exchange would turn profits into losses.

Extended credits have long been necessary in South American markets and all who are not prepared to allow them will be better off to confine their activities to home markets. Money is very scarce, and the life-long customs of the people cannot be changed so quickly as American manufacturers would like. It is true that long-time credit is a factor in any sale and very closely related with the cost of materials, but it has to be allowed in South America for the general customer. Of course, if a buyer gets long-time credit he is generally quite willing to pay a much higher price. It cannot be said that South America is a new market, because big business with European manufacturers has been carried on for upward of fifty years; nevertheless it is always a wise and safe plan to expect undue risk of principal.

Cash collection before the goods are shipped is practically impossible except with a few well-known South American business houses. Even with the largest business houses the usual credit terms are 30 to 50 per cent cash on the closing of an order, the remainder to be paid in six to eighteen months' time from the date of signing the order.

So firm is the German hold of the electrical industry in South America that some of the largest cities have adopted as standard German manufactures. For example, in the capital of Chile, Santiago, the American incandescent-lamp socket is condemned entirely as well as American wiring conduit and certain kinds of insulated wires, etc., and the German manufactures are made standard. This practice is followed strictly wherever a city or town has installed German machinery and plants for electric light and power purposes.

The price is the all-important factor. Quality is generally ignored, and this is the principal reason why German goods are used so generally throughout the republics. American goods in general are of excellent quality and well thought of; throughout the republics of South America German goods are acknowledged generally to be very inferior. For a long time past the attitude has been to avoid German goods as people have found from long experience that American and English goods are the best and and most reliable and cheaper in the end. But the question has almost always been one of price and credit, which the American manufacturer rarely cared to meet.

A great deal is being said about the immediate necessity for an American mercantile marine. This, of course, is warranted. But why is it that up to the present time available ships leaving the eastern ports of the United States for South American ports invariably go without full cargoes?

South American representatives in North America are practically worthless to American manufacturers. Customers must be seen and, preferably, known personally. Reliable customers want to know manufacturers and get as close to them as possible through the representatives from whom they order direct. The doubtful customers, who are plentiful, should always be known by the representatives of the American manufacturers.

The suggestion for the formation of export associations among manufacturers of allied lines is very good, because it will help the smaller manufacturers and those who have not sufficient plant, equipment or business to send their own representatives to South America. Such organizations must be fruitful, though not so effective as the long-standing German associations in which keen competitors have combined successfully to secure foreign business, particularly American business.

American manufacturers should also be warned about sending ordinary American "drummers" to South America. Only engineer-salesmen familiar with the languages, customs and business practices should be considered.

Pulacayo, Bolivia. WILLIAM T. TAYLOR.

Electricity in Central-Station Offices

Outline of the Electrical Equipment and Efficient Features of the New Office Building of the Hartford Electric Light Company

ONE of the most complete central-station office buildings in the country was placed in service last summer by the Hartford (Conn.) Electric Light Company. The structure embodies many excellent ideas with reference to the needs of a business concern, including the installation of semi-indirect lighting and the provision of elevator, vacuum-cleaner, air-washing and general power service for fan operation; but aside from

FIG. 1—NEW OFFICE BUILDING OF COMPANY

these it contains a large number of interesting equipment details which deserve special description. An unusually well-arranged display room is also an important feature.

The new building, five stories in height, 130 ft. long by 97 ft. wide, stands at 266 Pearl Street, the site for many years of the company's offices under the former presidency of Mr. A. C. Dunham. It represents a total cost of about $300,000 and is a concrete and steel structure with brick and stone trimmings. A night view reproduced in this article shows the present display lighting, which consists of 118 25-watt cornice lamps, six 60-watt lamps in globes carried on short standards just above the first story, and four 1000-cp nitrogen-filled units mounted on posts on the sidewalk. The street floor is occupied by the appliance and contract departments, the second and third stories being devoted to offices and the fourth floor to the lighting department, including a meter-testing room, laboratory, photometer and stock rooms. The top floor is at present used for storage, and a commodious basement contains a heavy stock room, boiler plant, accommodations for maintenance forces, and various mechanical and electrical equipment. At the rear is a private garage operated by the company.

The mechanical equipment of the building includes one inlet fan directly driven by a 20-hp motor, eight outlet fans of from ¼ hp to 5 hp, a motor-driven Automatic Refrigerating Company's water-cooling system supplying drinking water throughout the property, a sump pump, one 5-ton freight and two 2000-lb. electric passenger elevators, and an air-operated Lamson carrier system. A concrete floor is provided at the top of the elevator shaft to reduce noise, and the motors and control apparatus, which are of the alternating-current type, are installed in penthouses on the roof. The cornice lamps are each housed in a copper truncated cone 5.5 in. in diameter and 3 in. deep, with flexible-cord connection and a sliding cover facilitating renewal from the roof, the lamps being supported in a box-like structure accessible from above. A blueprinting room is provided on the third floor, which also is designed to accommodate quarters for employees' recreation in the future, and contains a lecture room with table equipped with electric service outlets. Weekly luncheons are held, the menu being prepared by electric range, and the company will probably conduct courses in electric cooking at some later time.

The main display room, a view of which is shown, is 104 ft. long by 24 ft. wide and occupies nearly the entire front of the building on the street floor. It is illuminated by ten 400-watt semi-indirect fixtures of the Bradley & Hubbard type, spaced 20 ft. apart longitudinally and 12 ft. apart laterally, each lamp being hung 14 ft. above the floor. Opposite the entrance are elevators leading to the offices on the upper floors. These are flanked by four cashiers' windows and four lamp-exchange windows, the office of the contract agent being at the eastern end of the room and that of the head of the appliance department at the opposite end. Four large display windows with built-up recesses 4 in. deep occupy the front of the room, and the central portion is equipped with desks and display tables, the latter being 7 ft. 1 in. long, 3 ft. 3 in. wide and 2 ft. 7.5 in. high, with ¼-in. plate-glass tops. Each table is provided with two end and three side outlets and is wired from a floor outlet through a ¾-in. copper pipe termi-

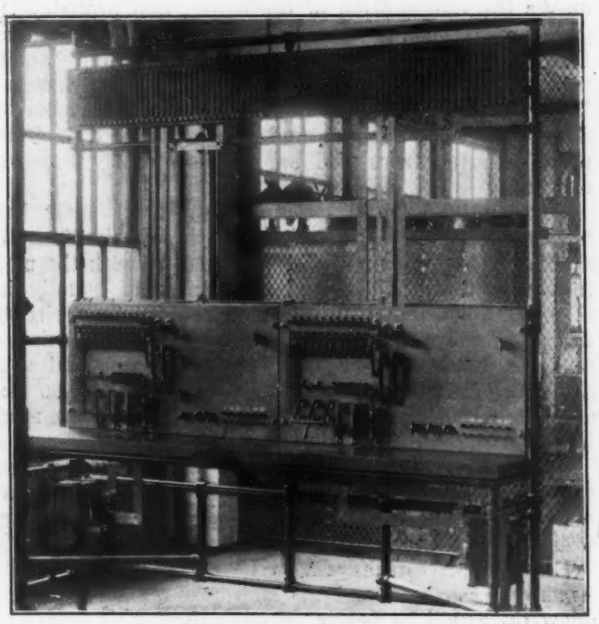


FIG. 2—1500-AMP TEST BOARD

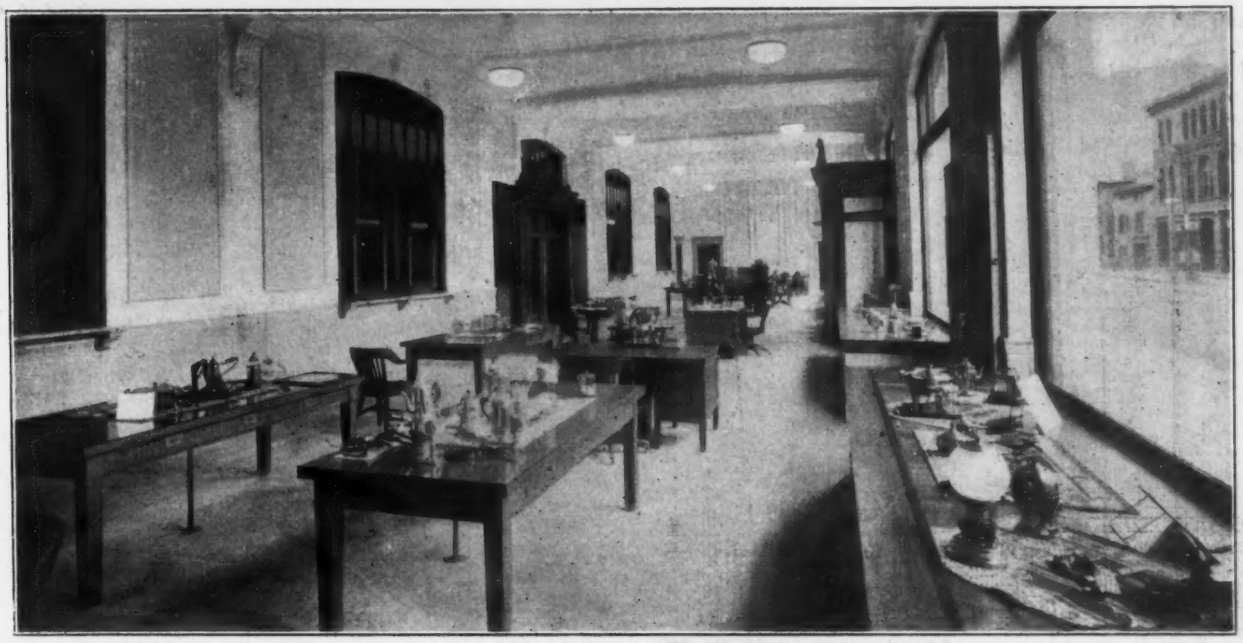


FIG. 3—DISPLAY ROOM OF THE COMPANY

nating at a condulet from which the table distribution is effected. Each table is also provided with three drawers for holding appliance parts, small fittings, etc.

The halls of the building are in general lighted by 60-watt lamps centered in Doric fixtures. The typical office is about 15 ft. by 18 ft. and lighted by four 150-watt semi-frosted lamps installed in a semi-indirect fixture manufactured by the United States Art Glass Company, Hartford, the standard height of fixture above the floor being 8.5 ft. Holophane steel reflectors are used in the basement, and by special permission from the insurance authorities the building was wired for alternating-current and direct-current service in accordance with the 1320-watt rule with No. 14 rubber-covered wire. In the first eight weeks that the new building was in service with the display room in use the appliance sales increased by 150 per cent.

The lighting department is equipped with five test tables designed and built by the States Company, Hartford, and illustrated herewith. The wiring for these tables is carried downward to them from the ceiling in 1.25-in. pipe conduit, which also serves to hold the tables in place. Any alternating-current or direct-current meter can be tested under service conditions. Three standard single-phase 50-amp tables are in service, using low-voltage current. One table is of 25-amp rating, using a 250-volt resistor load, and is also equipped with a phase shifter for testing meters at various power-factors. Another table is arranged for testing polyphase meters, using for load three banks of 250-volt resistors, which may be combined for either two-phase or three-phase balanced or unbalanced loads. Two potential phase shifters are provided and the total capacity of the table on single-phase testing is 75 amp. The fifth table may be used by two observers working independently up to 750 amp, or a total load of 1500 amp

FIG. 4—GENERAL VIEW OF TEST BOARDS

may be obtained for one meter. The table may be used for both alternating-current and direct-current testing. The load current is taken at low voltage, a constant-potential transformer being used for alternating-current work and a storage battery for direct-current service. This table was specially designed for the Hartford company and is also equipped with two phase shifters.

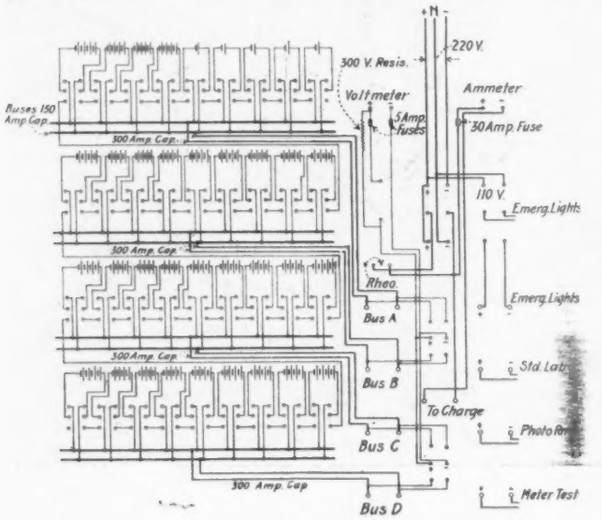


FIG. 5—BACK VIEW OF WIRING CONNECTIONS

A special battery room is provided with racks designed to hold 129 cells, and to provide a flexible means of using these cells a special switchboard has been installed. The board is arranged with four sets of buses, and each cell or group of cells in sets of four is wired to a double-throw switch by which it can be thrown upon the bus in multiple or in series with other cells, as shown on the diagram. All buses are connected to terminals on the front of the board, where test connections may be taken off, the buses multipled, etc., to a maximum rated output of 1200 amp, the diagram showing a possible voltage range from the potential of one cell all the way to the full voltage rating of the battery.

A special testing frame of convenient design is used in the meter laboratory. Attached to each table is a wooden cross-piece 6 ft. long and 2.5 in. square in cross-section, supported on uprights, the entire frame being slotted to the full depth of the frame member. The slots are about 30 in. long and are ¼ in. wide. Meters or other instruments can be quickly attached at any convenient height above the table by bolting through the slots as shown.

One of the illustrations shows a home-made motor-testing apparatus in use by the company. This consists of a platform to which the motor is bolted, a hollow pulley 12 in. in diameter, a canvas belt 6 in. wide, and a steel bar supported on knife edges, with adjustable weights and a steel screw with a 10-in. hand wheel by which the tension on the belt may be increased when the motor is running. The device absorbs the energy delivered at the motor shaft by heating the belt, and water is turned into the hollow pulley by a hose line near by. It is provided with various-sized split tapered couplings to fit different motor shafts, and when in operation a balance is obtained by sliding the weight along the steel bar until the right-hand end of the bar (not shown in the photograph) indicates equilibrium. The steel bar is raised and lowered by minute amounts as required, and the hand-wheel adjustment gives very fine gradations in the power output absorbed. The knife edges are exactly 1 ft. apart, to simplify the calculation of horse-powers absorbed from the weights, lever arms and speeds observed. The frame timbers are 6 in. by 6 in. in section; the steel bar is 6 ft. 4 in. long, 0.5 in. wide and from 2.5 in. to 3 in. deep. The motor platform is 5 ft. square and the belts vary in size for different motors, the largest being 11 in. wide, with wooden friction bands attached. The steel power-adjusting screw is 1 in. in diameter, and the hollow pulley has a 7.25-in. opening, with a copper drip pan 2 ft wide, 5 ft. long and 3 in. deep at the side. The frame is 5 ft. 6 in. high, and the apparatus, which will test a motor of 75-hp maximum without difficulty, cost approximately $400.

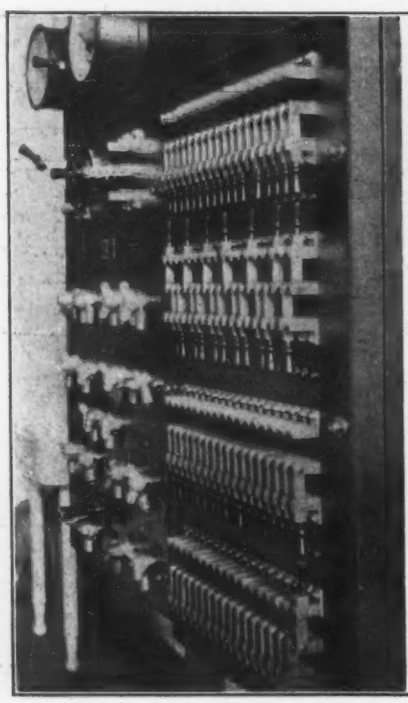


FIG. 6—BATTERY-ROOM SWITCHBOARD

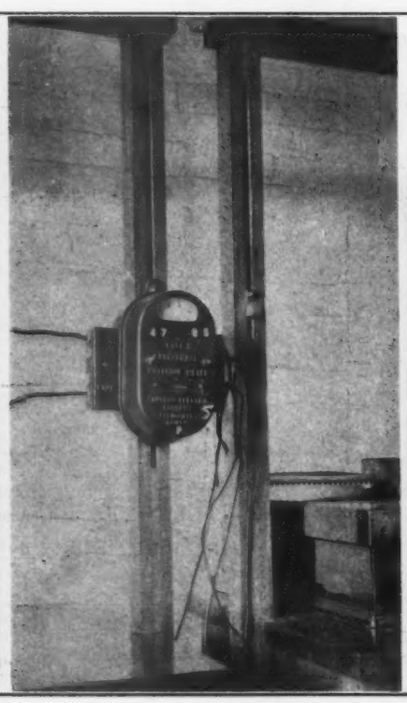


FIG. 7—LABORATORY TESTING FRAME

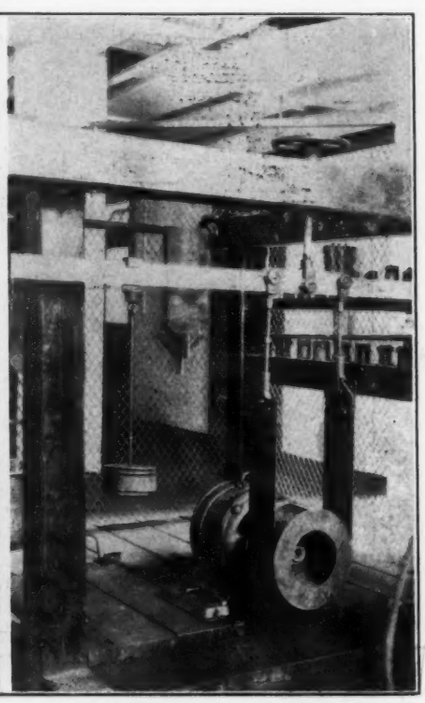


FIG. 8—MOTOR-TESTING EQUIPMENT

A fireproof lamp rack for life tests has been built of 2-in. by ⅜-in. steel angles. It clears the wall by about 1 ft. and the ceiling by about 30 in. It is provided with eighty-six outlets wired between lamp bases with bare copper, the feeds being from condulet and conduit as shown. The lamp bases are attached to the frame by porcelain knobs. Use is made of "No-ark" combination fuse and switch boxes, and the voltage and current variations required for testing are derived from a bank of auto-transformer coils shown herewith. The lamp rack is about 12 ft. long and 5 ft. wide, the lamps being about 8 ft. above the floor.

In the stockroom use is made of a simple meter storage rack of strap-iron. In a space 11 ft. high and 8 ft. wide 130 single-phase meters of from 5-amp to 150-amp rating can be carried. The 5-amp size is shown in the halftone. The meters are hung on ¼-in. screws and are 10 in. apart vertically on centers, the vertical straps being 9 in. apart on centers. The straps are 2 in. by ⅜ in. in cross-section. The same size of strap is used in storing polyphase meters. These are spaced 14 in. apart on centers horizontally and 16 in. on centers vertically. The straps are provided with lateral members 3 ft. 5 in. apart, and they are all bolted into the wall by ½-in. lag bolts. With the largest meters a clearance of from 4.5 in. to 6 in. is easily obtained between the casings.

An effective method of safeguarding the employee in the testing of arc lamps is employed. A fiber plug is pushed into the switch box to connect the lamp in circuit. The plug is attached to the box cover by a short leather strap, which prevents operating the switch unless the cover is down, protecting the user from accidental contact with live parts at the moment of making or breaking the lamp circuit.

Fig. 11 shows a flexible method of mounting a 1-hp motor which drives a pipe-cutting and pipe-threading machine in the fixture assembly room. The motor, like the others in the building, is a two-phase, 220-volt induction outfit, and being geared to the machine, which is driven by silent chain, can be adjusted by changing nuts on a bolt at the right-hand end of the motor bedplate. This adjustment is a convenience in tightening or replacing the chain, which is guarded by an angle-iron, and the motor itself is equipped with an oil guard of sheet iron. The left-hand end of the bedplate is arranged to rotate about an axis which facilitates further adjustment of the motor. The pipe threader can handle tubing having a diameter of from ⅛ in. to 2 in.

Another feature of the building is a machine shop,

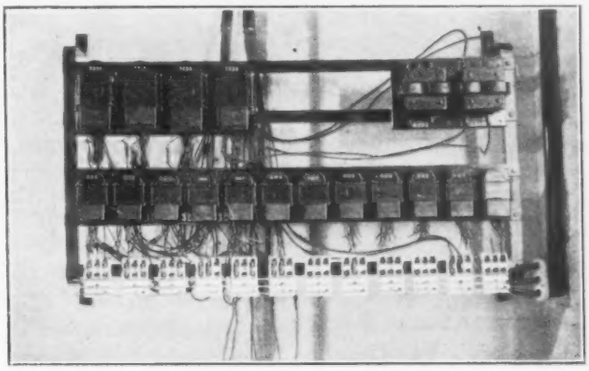


FIG. 9—ECONOMY COILS FOR TESTING LAMP LIFE

all the tools being driven by individual direct-belted or geared motors. There are in use a Whitcomb & Blaisdell lathe, with 1.5-hp motor; a 2-hp drill press, 0.5-hp upright drill, 3-hp shaper with Westinghouse motor, and a double emery grinder directly driven by a 1.5-hp motor. Usually these machines are started by a two-phase knife switch mounted in a sheet-metal box carried on or near the frame, with push-button control at the operator's post. The latter is energized by a 110-volt alternating-current circuit wired to a solenoid switch on the machine which makes and breaks one wire in each phase as the operator pushes the button, starting and stopping the machine without the loss of time required to go from the working position to the switch box.

Fig. 12 shows a typical push-button, with flexible conduit wiring, solenoid case and switch box on a drill with independent motor.

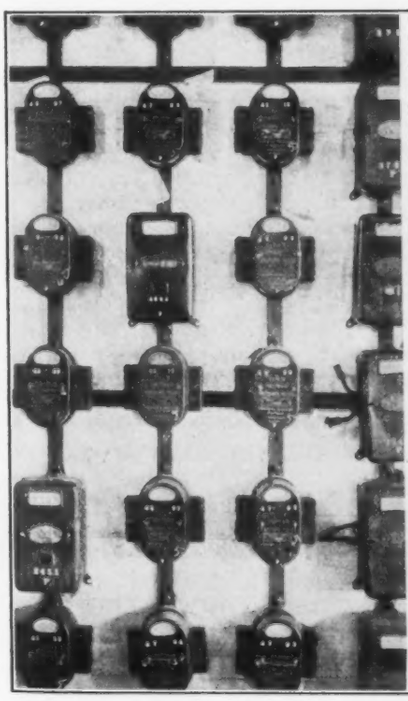


FIG. 10—POLYPHASE METERS STORED

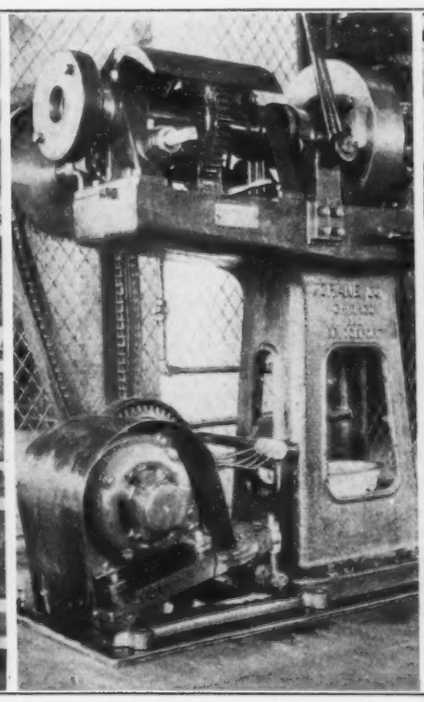


FIG. 11—MOTOR-DRIVEN PIPE CUTTER

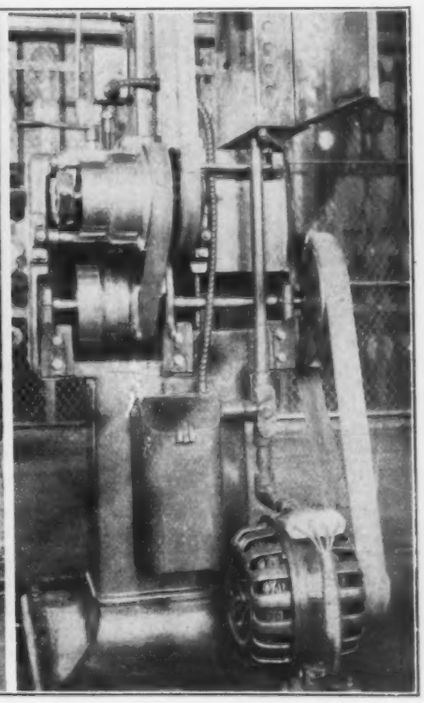


FIG. 12—MOTOR-DRIVEN DRILL

Polarity Reversal in Synchronous Converters

Experimental Study of the Conditions That Are Brought About When the Reversing Switch in the Field Circuit Is Used

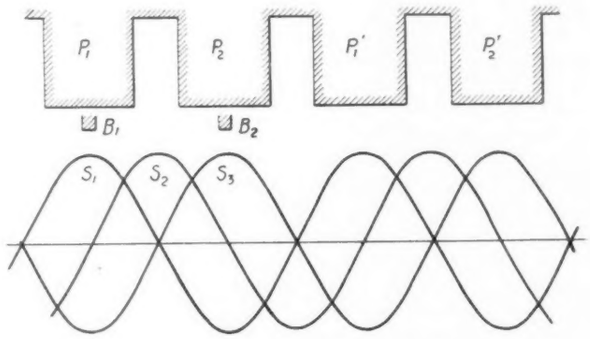
BY E. R. SHEPARD

IT is a matter of common knowledge that in starting synchronous converters from the alternating-current side the direct-current polarity may build up in either the correct or the reversed direction, depending upon chance. In order to correct reversed polarity, a reversing switch is placed in the field circuit of each converter. The up position of this switch is the running position while the down position is used only for the purpose of correcting a reversed polarity. Throwing the switch down is said to cause the converter to "slip one pole," thus changing the polarity. Just what happens when the switch is thrown down and the precise manner in which the polarity is thereby reversed are not discussed in textbooks. Many articles on this subject have been consulted by the present writer. Without an exception they contain the brief statement that the polarity in a converter may be reversed by reversing the field switch, and with one or two exceptions the reader is left with the impression that only one reversal is necessary and that either position of the field switch may be the running position. As to a detailed theoretical discussion of the subject almost nothing is available.

In an experimental study of this subject use was made of a 10-kw, four-pole, three-phase synchronous converter in the electrical laboratory of the Oregon Agricultural College. The alternating current in the windings of a polyphase converter produces a magnetic field which rotates with respect to the armature at a speed equal to the synchronous speed of the armature irrespective of the actual speed of the latter and in the opposite direction to that in which the armature rotates. In order to show visually the relative speed of the armature and of the rotating field produced by the alternating current supplied to it, a stroboscopic disk, consisting of four black and four white sectors, was attached to the end of the shaft. This disk was illuminated by an arc lamp supplied with alternating current from the same source as the armature. With the armature running at synchronous speed this disk appeared to stand still. Any change in the speed of the armature was shown by an apparent turning of the disk from this normal position. The slightest hunting could be detected by an apparent oscillation of the disk about this position, and the slipping of a pole or half pole was made strikingly realistic by the apparent turning of the disk through a corresponding angle. A voltmeter was connected to the direct-current brushes and a small compass was provided for testing the polarity of the fields.

Upon supplying the converter with alternating current at half voltage with the field switch open, the armature came up quickly to synchronous speed. The stroboscopic disk showed that it ran slightly past its final position, then swung back a few degrees and locked into step. With the field switch open the voltmeter read 72 volts and the compass showed the poles to be alternately north and south. Upon closing the field switch in the up or running position the emf increased to 84 volts. There was no apparent shift of the armature as shown by the disk, and no change in the polarity of the fields. Upon closing the field switch in the down or wrong position (reversing the main field) the direct-current armature voltage dropped to zero and reversed to 5 volts negative, and at the same time the disk showed a slip of one-half pole in a direction opposite to the direction of armature rotation. Each pole was now found to contain a north tip and a south tip, the two adjacent tips of adjacent poles being of the same polarity. Moreover, when two pilot brushes connected to the terminals of the voltmeter were touched to the commutator midway between the main brushes the voltmeter read 72 volts. This indicated that the neutral point of the commutator had also shifted half a pole. Upon opening the field switch the disk slipped another half pole in the same direction and the voltmeter came up to 72 volts in the negative direction. The poles had also reversed polarity.

With the switch in the down position the main brushes were shifted along the commutator. Violent sparking ensued and the armature fell out of step and began slipping poles at a slow but constant rate, the voltmeter meanwhile swinging alternately from positive to negative. Upon opening the field switch this slipping was instantly stopped and the armature again assumed



ROTATING FIELD IN THREE POSSIBLE POSITIONS

synchronous speed. Again, with the switch in the down position the armature was loaded by retarding the pulley with a lever. This mechanical shock produced the same result as the electrical shock due to shifting the brushes, and the slipping of poles began again and continued after the brake was removed. It was instantly stopped by opening the field switch.

With full voltage across the slip-rings of the converter and the field switch open, the direct-current voltmeter showed 180 volts. Upon closing the field switch in the down or wrong position violent sparking at the brushes resulted and the emf dropped to about 20 volts. Upon opening the field switch the voltmeter read as before, showing that a reversal could not be effected with full voltage across the slip-rings.

An attempted explanation of the phenomena here described is given below.

When alternating current is supplied to the slip-rings of the converter a rotating magnetic field travels around the armature at synchronous speed. This magnetic flux induces eddy currents in the pole faces and in the damping windings of the converter, and this action together with the hysteresis lag of the magnetism in the poles brings the armature up to synchronous speed. The direction of rotation of the armature is opposite to that of the rotating field, so that when the armature is rotating at synchronous speed the rotating field will

stand still in space. As the armature approaches synchronous speed the polarity of the fields will be continually reversed, the reversals becoming slower and slower until the poles of the rotating field lock with the salient field poles. Referring to the accompanying figure, S_1, S_2 and S_3 represent the rotating field in three possible positions. P_1 and P_2 are normally north and south poles respectively. B_1 and B_2 are normally negative and positive brushes respectively. B_1 will be negative if the armature locks in the position S_1 but positive if it locks in position S_3, that is position S_1 corresponds to normal operating conditions. With the rotating field in position S_1 a north pole is induced in P_1, while in position S_3 the rotating field will induce a south pole in P_1. If the field switch be closed in the up or normal position with the armature in position S_1, then P_1 will be strengthened in its polarity, owing to the field current, and the machine is in normal operation. If, however, the field switch be closed in its up position when the armature is in position S_3, then P_1 will be strengthened in its polarity, but B_1 will be positive instead of negative; that is, the polarity of the brushes is reversed.

If the field switch be closed in its down or reverse position when the armature is in position S_3, a current will be produced in the field coils which tends to reverse the polarity. If the magnetomotive force of the shunt-field circuit is greater than that of the armature, the polarity of the field poles will be reversed. One of two things will happen, namely, the armature will slip half a pole and take up some such position as S_2, or it will continue to slip poles at a rate depending upon the inertia of the armature and the time-constant of the field circuit. As soon as the fields are reversed or the flux in them is reduced to zero the armature will begin to slip, and as soon as it reaches the position S_2 no current will exist in the field windings, as B_1 and B_2 are then at the same potential. In this position the adjacent tips of P_1 and P_2 are both north and the adjacent tips of P_2 and P_1 are both south. This will allow the armature to slip still farther. As soon, however, as it passes the position S_2 B_1 becomes slightly positive and B_2 slightly negative, thereby producing a field current which will give P_1 a north polarity and P_2 a south polarity. Thus the armature will be held from further slipping. If, however, the time-constant of the field circuit be sufficiently great or the inertia of the armature sufficiently small, the position S_2 might be reached before the field current attains a value great enough to lock the armature. Under these conditions the armature will continue to slip poles at a definite rate. The same thing may result from a violent mechanical shock to the armature such as the sudden application of a load. If the field switch be opened while the armature is in position S_2, it will slip a half pole and lock into position S_1, and when the field switch is thrown into the normal position the normal polarity of the brushes B_1 and B_2 is established.

Starting Compound Converters

The above discussion relates to a shunt-wound machine. In regard to starting compound converters it is stated in the "Standard Handbook" that "if other converters are carrying load the separate excitation of the series field through the equalizer will tend to give correct polarity."

Where one converter is to be paralleled with others, provision is often made for obtaining current for the shunt field circuit from the bus or trolley. This should insure correct polarity without further precaution, although at least one well-authenticated case is known where a machine started under these conditions was connected to the bus with disastrous results because the armature "slipped a pole."

REFLECTION FROM PAINTED SURFACES

Examination of the Coefficient of Reflection of Different Tints in Its Relation to Indirect and Semi-Indirect Lighting

By Dr. Louis Bell

SEVERAL calls for information on the coefficient of reflection to be expected from painted surfaces have suggested to the writer the propriety of recording some of his experiments of the past few years. He has examined a great number of samples ranging from white to dark buffs and greens, and the range of coefficients to be found in them is about the same as that recorded in an I. E. S. paper* on coefficients of diffuse reflection based on the examination of wall-papers.

The point of special interest as respects the coefficient of reflection of paints is associated with their use for ceilings and walls from which artificial light is supposed to be reflected. Ceilings, as a rule, are fairly light in tone, but walls are sometimes painted, through ignorance or an eccentric idea of esthetics, in colors so dark as to render lighting exceedingly difficult. Just now, when there is a strong tendency toward indirect and semi-indirect illumination, the importance of choosing the proper paints comes to the front. For these methods are none too efficient even under the most favorable circumstances, and by the choice of an improper wall color it is very easy quite to defeat the design of the illumination.

The experiments made on paints by the writer were very simple. The coefficient of samples laid upon firm cardboard was determined in the following manner: The ordinary diffusing disk was removed from a Lummer-Brodhun screen on the photometer bar and replaced by two slips of white bristol board cut to fit, the similar surfaces of the two slips being placed together and the slips in addition being cut side by side from the same sheet. Then, with the carriage placed at the center of the bar, an incandescent lamp, usually a tungsten lamp of medium power, was placed at each end of the bar, and to the voltage on one of them such slight variation was then given as might be necessary to balance the illuminations on the bristol-board screens. After this was done the samples of paint laid on cardboard were trimmed to the necessary size to substitute for one of the bristol-board standards, and the photometer was then balanced in the ordinary way, giving the relative reflecting power of the two surfaces for light incident at 90 deg. and returned at moderate degrees of obliquity. The reflecting power of the standard cardboard having been ascertained in absolute measure by direct observation, the coefficients of the samples of paint were at once ascertained.

The above method is very easily applicable for all light shades because the color difference involved is not enough to make any considerable disturbance of the settings. Even on the dark shades the color was seldom strong enough to make trouble, for as a rule paints used for interior finish are not brilliant enough in color to interfere in photometry. The annexed table from the author's notebook contains a list of coefficients for such colors as are commonly used on ceilings and walls where any attempt is made to secure a light surface such as one would choose in painting with some regard to the effect on the illumination. It will be noted that the highest percentage obtained is 65.7 for a practically white oil paint of medium gloss and selected for the purpose of being a good reflector. It is difficult to get much above this figure with commercial paints adapted to general use. The next in the order

Transactions, Illuminating Engineering Society, Vol. 2, page 653.

of excellence is the same paint with the very faintest trace of cream tinge. Less than half the samples tested showed coefficients above 50 per cent and all of those that did so were of very light creamy or yellowish tones. They include both water and oil paints, though the indications are that a carefully selected oil paint is rather the better of the two as regards reflection. The deeper tones of yellowish and the faint green tones fell decidedly below in reflecting power, and those of stronger tint in the same direction lower still, ending with an apparently rather light olive water color at the bottom of the list with 32.7 per cent.

As to the composition of the colors, all those which showed a good value for the reflection were tinted, if at all, with the merest trace of yellow pigment, presumably chrome or stone yellow. The least trace of black in the pigment, such as would give only the faintest suggestion of a gray tone, is fatal to good reflection, and the same is true to almost an equal extent of red. A very light gray "warmed a bit" with red, as the painter might say, gives a tone that is extraordinarily deceptive, since to the casual observer it looks very light and it really absorbs an astonishing amount. The greens are found to be distinctly worse than the yellows, but a good deal better than the blues, even the lightest of them. Blues, however, are rarely used on account of the general cold tone.

REFLECTION FROM PAINTED SURFACES.

Color	Kind of Paint	Percentage Reflection	Remarks
White	Oil	65.7	
Extremely faint cream	Oil	61.0	
Faint cream	Water	59.2	
Faint cream	Water	55.4	
Light cream	Oil	52.8	
Light cream	Water	52.0	
Light cream	Water	52.0	
Pale yellowish	Oil	51.4	White with stone yellow.
Faint buff	Water	51.0	
Pale yellowish	Oil	51.4	White, lemon, chrome yellow.
Light yellowish	Oil	48.0	White, stone yellow.
Pale yellowish	Water	46.8	
Very faint greenish	Oil	46.0	White, chrome yellow, chrome green.
Very faint greenish	Water	45.8	
Faint gray	Oil	45.6	White, stone yellow, black.
Pale greenish	Oil	45.0	White, chrome green.
Pale yellow green	Oil	44.5	White, chrome green, chrome yellow.
Pale grayish buff	Water	44.0	
Light greenish	Water	43.9	
Light greenish	Water	43.7	
Light greenish	Water	43.1	
Medium buff	Water	40.2	
Light greenish gray	Water	38.6	
Light olive	Water	32.7	

The accompanying table is intended merely as a rough guide with respect to the tones fairly adapted for cases of indirect and semi-indirect lighting. One must remember that the values given are for absolutely fresh and clean samples. The effect of dust is, of course, to darken any of the painted surfaces, thereby lessening the reflection in no inconsiderable degree. In this matter the water-color paints are more objectionable than the oils because they will not withstand cleaning so readily. Except in the case of an oil painted surface so situated that it can conveniently be cleaned rather often, it seems to be unsafe to rely on an ordinary coefficient of reflection greater than 50 per cent. There is no particular reason why ceilings should not be practically white at the start, but walls are generally tinted, often to fairly dark tone, and in such case the effect on the general lighting, even when the indirect system is used, must be borne in mind. Two rooms, with white ceilings, lighted to very nearly the same degree in initial intensity will show very material difference if one room has, for example, light buff walls and the other fairly dark green walls. The coefficients of the darker paints, of course, may be very low.

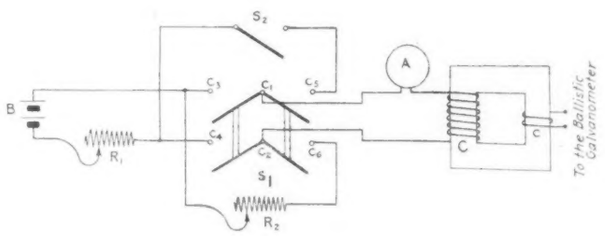
DETERMINATION OF HYSTERESIS LOOPS

A Simple Method Giving Accurate Results When Use Is Made of Only One Exciting Coil

BY ARLE YTTERBERG

IN the so-called "step-by-step" method of determining the hysteresis loop the exciting current is changed by small steps from a positive to a negative maximum and back again, and the corresponding changes in the induction are determined with a ballistic galvanometer. The total induction corresponding to any given current is found by summing up the measured changes in the induction for the several steps, with the result that errors of observation or calculation are cumulative.

In the method proposed by Evershed and Vignoles this difficulty is avoided. In this method two windings are placed on the sample of iron to be tested. In one winding is established a constant current corresponding to the maximum induction desired. A current of suitable strength, producing a magnetomotive force in the opposite direction to that of the first coil, is then suddenly sent through the second coil, and the corresponding diminution of the resultant induction is determined by means of the ballistic galvanometer. This current is then broken and the original mmf is re-established, and the process is repeated with successively smaller values of the current in the second coil. The latter coil must be capable of carrying a current which will produce an



APPARATUS FOR OBTAINING HYSTERESIS-LOOP DATA

mmf twice as great as that of the first coil, in order to obtain the negative half of the loop.

After each point on the loop is found, the current through the first exciting coil may be reversed several times to insure the re-establishment of the original maximum induction, although if this maximum induction is well above the knee of the curve such reversals may not be found necessary.

The advantage of the method of Evershed and Vignoles over the step-by-step method is that every point on the cycle is determined independently. The chief objection to this method is that a second exciting coil is necessary. As the space for the coils is usually limited, it follows that when two coils are used they must be made of smaller wire than would be required for a single coil, and therefore the windings heat up more rapidly. The effect of this heating is to increase the resistance, producing the slow change in the exciting current and in the induction, and since the change in induction is slow it is not recorded by the ballistic galvanometer.

By using the connections described below all the advantages of the Evershed and Vignoles method may be secured with a single exciting coil. The connections are shown in the accompanying illustration, wherein *C* is

the exciting coil in series with the ammeter A and S_1 is a double-pole reversing switch. A rheostat connected in series with the battery B is shown at R_1. A single-pole knife switch is shown at S_2 and a resistor of variable resistance at R_2.

The procedure when these connections are used is as follows: At first the resistor R_2 is short-circuited and the switch S_2 is closed. The switch S_1 is then closed, making contact at c_3 and c_4, and the exciting current is regulated to the proper amount by means of the rheostat R_1. The current through the coil is then reversed several times by throwing the switch S_1 back and forth, and switch S_1 is finally closed on the contacts c_3 and c_4. The switch S_2 is then opened and the resistance of R_2 is regulated to a suitable value. The switch S_1 is then turned until the blades touch simultaneously all four contacts. A strip of wood placed under the blades of the switch makes a convenient stop for the purpose. Throwing the switch S_1 into this position connects R_2 in parallel with the exciting coil C, and therefore reduces the current through it. The swing of the galvanometer then registers the corresponding diminution of the induction in the sample.

To obtain the next point on the loop, the switch S_1 is turned back to its original position, the resistance of R_2 is set at a lower value, and the operation above described is repeated, and so on for as many positive values of the mmf as may be desired. The point corresponding to zero value of the mmf is found by short-circuiting the resistor R_2. Points on the loop corresponding to negative values of the mmf are determined by closing the switch S_2, and for the first point putting R_2 to its maximum value. The switch S_1 is then quickly thrown all the way over until the blades are in contact with c_3 and c_6 only. This reverses the current through the exciting coil and puts this coil in series with both R_1 and R_2. The next point on the curve is then found by throwing S_1 back to the contacts c_3 and c_4, setting R_2 to a lower value, and repeating the process, finally short-circuiting the resistor R_2 for the negative maximum of the mmf.

It should be noted that at no step in the procedure above described is the current through the exciting coil interrupted, but it always passes from one value to the next in virtue of a more or less complete short-circuiting of the coil. That is, the current changes gradually (along a logarithmic curve, the slope of which depends on the time-constant of the circuit) from one value to the next. The cycle of changes produced by this method of operation therefore approaches more closely the cycle produced by an alternating current than is the case with any method in which the current through the exciting coil is suddenly interrupted.

Electricity in an Indian School

South of Arkansas City, Kan., just over the Oklahoma line, is the Chilocco Indian Industrial School, where boys and girls between the ages of fourteen and twenty-one years receive instruction in practical engineering, the various trades, agriculture, domestic science, art and music. Natural gas, piped from the Oklahoma fields, is used as a source of power for the school's heating and electric-service plant. Applications of electricity have been made to the machines in the shops where the Indian boys receive instruction and in the sewing-rooms used by the girls. Members of the Kansas Electrical Association visited the school at the time of the recent convention at Arkansas City, and many were surprised to note the dexterity of the Indian children from the reservations in handling electric irons and other electrical devices.

ACCOUNTING FOR DEPRECIATION

Advantages of Methods That Conduce to a Clear Understanding on the Part of Examiners

By James R. Cravath

THE object of this article is to call attention to certain methods of keeping depreciation accounts which are conducive to a clear understanding on the part of the examining engineer or stockholder, as opposed to other common methods that do not readily show essential information. With the exception of a few electric public utility properties which are very large and have widely scattered interests, most properties have so great a proportion of total capital invested in apparatus or plant which will call for a heavy renewal expense at one time that it would be entirely unsafe not to lay up a depreciation reserve. As an extreme example, take an electric-light plant in a small town. Its power plant may represent approximately one-half the total investment. The day may come when nearly all of this power-plant investment will have to be set aside or written off because the plant is worn out or inadequate. In such a case a heavy depreciation reserve in addition to ordinary maintenance expenses is evidently necessary.

Much of the discussion on depreciation during the last few years has been due to the fact that the necessity of provision therefor was ignored by many companies for many years. Rate regulation has brought companies to a realization of the importance of making provision for depreciation in their accounts.

The necessity for calling attention to the importance of proper accounting for depreciation has been brought home to the writer during investigations of various public utility properties, in some of which depreciation had been written off annually, while in others no allowance had been made. In some cases where depreciation had been written off it involved considerably more labor to determine the true state of affairs by going back through the books than in cases where nothing whatever had been done with the item of depreciation.

The balance sheet should either show the following figures or make it easy to obtain them:

(A) The total first cost of all plant and property without deduction for depreciation.

(B) The total estimated accrued depreciation irrespective of renewals made and paid for.

(C) Depreciation actually paid by the replacement or renewal of certain parts.

Item A, total first cost of property, should not include any costs of renewals. It should include only the first cost of all plant and property plus additions and extensions. This will show at a glance the total amount on which depreciation is to be estimated. Item B represents, of course, merely an estimate of the loss in value due to depreciation, but if it be given in full the person making the examination can make whatever allowances he desires above or below the figure given. In some cases the entries for this item are involved to such an extent with the depreciation that has actually been paid or made good that no fair judgment can be formed as to the amount of either. As to item C, it is obviously desirable to know how much is actually being paid out to make good the estimated depreciation.

If the foregoing items appear on the balance sheet and the full accrued depreciation is stated as a liability, it is evident that such portion of the depreciation as has already been paid should appear as an asset to offset part of this liability. Another way of handling the matter would be to give the total cost of the property and to set down as a liability only such portion of the depreciation as is still payable or accrued

and not paid. In such a case the current operating account must be consulted to determine the total amount allowed for depreciation accrued; this is equally satisfactory provided the operating account shows the totals for a considerable number of years.

On the theory that the property account at all times should show the value of the property after the deduction of depreciation, some accountants credit it with accrued depreciation each month or each year so that the balance shows the first cost of the property, less depreciation. This, in itself, is not incorrect, but it leads to considerable inconvenience. When, however, this practice is followed by an estimate of depreciation as a certain percentage on the depreciated value of the property it is obvious that it will lead in time to an error of considerable magnitude because it would mean writing off an amount for depreciation that decreased year by year instead of a certain percentage of the original cost. For example, by the time the property had been depreciated to 50 per cent of its original value the yearly accrued depreciation would be figured as only one-half the yearly amount taken at the beginning.

If the actual first cost is shown, the amount upon which depreciation must be figured is available immediately. The examiner avoids the troublesome process of finding the amount deducted for depreciation and adding it to the book value of the plant and property in order to determine the value upon which depreciation is to be figured. Furthermore, it frequently happens that the examiner wishes to assume a different rate of depreciation than that assumed by the company. It is usually easier to figure anew, beginning with the actual first cost of the property, than to unravel previous assumed depreciation figures, which may or may not be correct.

Simple Methods of Accounting

As to the actual accounting necessary, there are various ways of accomplishing the result, but two of the simplest are the following:

One is to keep a regular ledger account called "depreciation paid" or by a similar term, indicating that the object of the account is to show only the money actually paid for replacements and renewals necessitated by depreciation. As this account applies only to renewals actually made, it should not be confused with the estimated accrued depreciation, which for a given year may be more or less than the depreciation actually paid. If such a "depreciation paid" account is the only ledger account kept relating to depreciation, this account should be charged and cash should be credited with all expenditures on renewals and replacements. In annual or monthly statements and balance sheets accrued depreciation can be entered as a liability with paid depreciation as a partially offsetting asset, in which case the accrued depreciation will not appear on the ledger account but only on the balance sheet.

If the total "depreciation accrued," whether paid or unpaid, is to be kept as a ledger account, one of the simplest ways to get the desired information is to keep with the "depreciation accrued" account an account which may be called "depreciation payable." Such an account is of the same character as notes payable or accounts payable. Having started a ledger with "depreciation accrued" and "depreciation payable" accounts under an ordinary double-entry system, the following entries should be made: At the end of each month or each year depreciation accrued should be debited with the estimated amount of depreciation, itemized as fully as may be desired. If depreciation is estimated on the property as a whole one entry will suffice. If each class of property is figured at a different rate of depreciation, an item should be provided for each class, preferably showing the amount upon which the depreciation is figured and the percentage. As a corresponding entry "depreciation payable" should be credited with the same items. When replacements and renewals are paid for, there are two methods of correct handling with such a classification. One is to charge "depreciation payable" with the amount of such renewal and credit cash. If the renewal is not only a renewal but also an enlargement, as for example where a large generator is substituted for a small one, "depreciation payable" would be charged with only that part of the renewal which was represented by the original cost of the generator replaced, and the remainder of the cost would be charged to plant and property as an enlargement. The other method, which is preferred by some, is to charge plant account with the entire cost of the renewal and debit cash. To offset the charge against the property account, the property account is credited with the real or estimated original cost of the apparatus replaced, and at the same time "depreciation payable" is charged.

With such an arrangement of depreciation accounts a balance sheet might be made to show total depreciation accrued as a liability, and from this the depreciation payable could be deducted to indicate as an offsetting asset the depreciation paid. If depreciation payable appears as a liability, as would be preferred by some because it involves no irregularities in making up a balance sheet, the desired information as to accrued depreciation and the depreciation actually paid would not appear on the balance sheet but could be obtained quickly by deduction of the balance shown on the "depreciation payable" account from the balance shown on the "depreciation accrued" account.

Should the depreciation actually paid in a year exceed the depreciation estimated as accrued, it is evident that either the accrued depreciation is not estimated high enough or that some temporary abnormal condition has increased the depreciation paid above the proper average. If the latter is the case, the "depreciation paid" account will show a debit balance which, in effect, is equivalent to "depreciation prepaid."

Importance of Accurate Terminology

There is opportunity for considerable confusion in the use of terms in connection with depreciation accounts. Sometimes the word "accrued" is applied only to an amount payable, and again (as here) it is applied to the total sum accumulated regardless of how much is paid. Some companies keep a depreciation reserve account, which may or may not mean that a reserve fund is actually put aside. In many cases it simply means the estimated accrued depreciation corresponding to the "depreciation accrued" account as herein suggested. The simple heading "depreciation" applied to an account gives little idea of its real nature. It may be used to show accrued depreciation or depreciation paid, or both. In the latter case depreciation is charged and the property account is credited yearly or monthly with the estimated accrued depreciation, and when money is put back into the property to make good past depreciation the property account is charged and cash is credited. The result shows the book value of the property less the accrued depreciation, including both that which has been paid and that which has not been paid. No fault is to be found with the accuracy of this method, but it does not give results in convenient form. It is impossible with a single depreciation account to provide the information desirable.

Opinions may differ as to the desirability of show-

ing on balance sheets and statements the first cost of the property, the total depreciation accrued to date, and the depreciation paid to date, but the intelligent reader of such statements could form a much better idea of the real treatment of depreciation if these figures were obtainable readily.

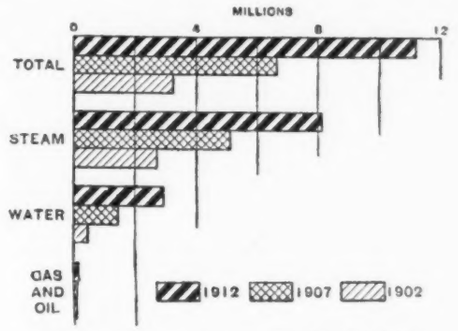
CENSUS OF PRIMARY POWER EQUIPMENT

Development in Steam Turbines and Large Units Shown by the Census Returns

The Bureau of the Census returns on primary power equipment of central stations in 1912 cover steam engines, steam turbines, gas and oil engines and waterwheels. The classification was changed somewhat in the return for the three census periods of 1912, 1907 and 1902. Steam turbines were shown separately in 1907 and 1912 but were included with steam engines in 1902. Auxiliary engines were shown separately in 1902 and 1907 but were not reported separately in 1912.

Progress has caused the abandonment of generating equipment in many small stations. In 1912 9.7 per cent of the stations making returns reported no generating equipment, while in 1907 only 4.8 per cent of the stations reported no generating equipment.

Central stations and electric-railway plants combined showed in 1912 a total horse-power rating of engines of 11,193,699. This is an increase of 69.4 per cent over 1907 and 249.3 per cent over 1902. The gain in horse-power rating was greater in central stations than in electric railways. From 1907 to 1912 the gain for



PRIMARY-POWER CHART, 1902-1912

central stations was 83.7 per cent as compared with 45.4 per cent for electric railways. From 1902 to 1912 the gain was 308 per cent for central stations and 169.6 per cent for electric railways. Of the total horse-power rating in 1912 72.5 per cent was in steam units. The distribution of the horse-power rating in percentages in 1912 was as follows: Steam engines, 32.1 per cent; steam turbines, 40.4 per cent; gas and oil engines, 1.2 per cent; waterwheels and turbines, 26.3 per cent. The total number of steam turbines in 1912 increased 138 per cent over 1907 and the increase in horse-power rating was 233.9 per cent. The number of central-station machines increased from 10,998, with a total rating of 4,098,188 hp, in 1907 to 11,893, with 7,528,648 hp, in 1912. The number of electric-railway machines decreased from 3637 with 2,519,823 hp in 1907 to 2695 with 3,665,051 hp in 1912. Thus while central stations increased to a small extent in number and a large extent in horse-power rating electric railways actually decreased in number but greatly increased in total horse-power rating. The average capacity per machine was 767 hp in 1912 as compared with 452 in 1907 and 301 in 1902. Electric-railway plants increased from an average rating of 484 hp in 1902 and 693 in 1907 to 1360 in 1912. The gain in central stations was not so large, being from 235 hp in 1902 and 373 in 1907 to 633 in 1912.

The accompanying diagram shows the primary power by the character of power in 1912, 1907 and 1902.

Primary Horse-Power

Table I published herewith shows the average primary horse-power per station and per machine in commercial and municipal central electric stations in the three census periods. This indicates the larger average rating per station and per machine of the commercial plants as compared with municipal stations. Thus the average per municipal station in 1912 was 18.8 per cent of the average per commercial station; the average per municipal machine was 29 per cent of that of the commercial machine. The average primary horse-power per station in commercial plants increased from 1907 to 1912 74.6 per cent. The average primary horse-power per municipal station increased from 1907 to 1912 39.3 per cent.

TABLE I—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE PRIMARY HORSE-POWER PER STATION AND PER MACHINE

Kind of Power	Commercial			Municipal		
	1912	1907	1902	1912	1907	1902
Total power:						
Per station	1905	1091	601	358	257	196
Per machine	748	421	253	217	159	134
Steam engines and steam turbines:						
Per machine	780	427	253	201	165	139
Steam engines—						
Per station	678	593	523	257	240	198
Per machine	324	301	253	160	157	139
Steam turbines—						
Per station	7614	4694	*	1518	1140	*
Per machine	3204	2293	*	886	668	*
Gas and oil engines:						
Per station	171	209	131	115	109	64
Per machine	106	129	76	79	78	53
Waterwheels and turbines:						
Per station	2558	1606	806	1086	341	224
Per machine	879	566	327	484	198	137
Auxiliary engines:						
Per station	†	228	78	†	33	32
Per machine	†	83	41	†	21	23

*In 1902 steam turbines were included with steam engines.
†Not reported separately.

Steam Engines and Turbines

Table II published herewith shows steam engines and steam turbines by horse-power rating in the three census periods, divided between commercial and municipal electric central stations. From 1902 to 1912 the rating of steam engines and steam turbines combined in both classes of stations increased from 1,379,941 hp to 4,946,532 hp, or 258.5 per cent. The 1912 statistics of horse-power rating may be grouped as follows: 500 hp and under, 22.1 per cent; over 500 hp and under 2000 hp, 19.7 per cent; 2000 hp and under 5000 hp, 17.1 per cent; 5000 hp and over, 41.1 per cent. The horse-power reported for the engines of 2000 hp and over comprises 58.2 per cent of the total horse-power in 1912 as compared with 10.8 per cent in 1902. The municipal central stations reported no steam turbines or steam engines of 5000 hp and over in either 1912 or 1907. From 1907 to 1912 the total of the reciprocating engines in commercial and municipal stations combined increased 82,036 hp, or only 4.5 per cent. The total of reciprocating engines with a rating of 5000 hp or over decreased by 10,246 hp, or 8.9 per cent during the five years.

Unfortunately, data for steam turbines were not obtained separately in the 1902 census but were included in the totals for steam engines. In commercial and municipal stations combined the rating of the steam

turbines was increased from 1907 to 1912 by 2,237,046 hp, or 273.7 per cent. The tendency toward increase in the use of turbines of large rating is shown by the fact that while the turbines of 5000 hp or more composed 49.8 per cent of the total rating in 1907, they aggregated 63.1 per cent in 1912. Turbines of the different classes of rating, however, showed an increase in each case in number and horse-power from 1907 to 1912.

TABLE II—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—STEAM ENGINES AND STEAM TURBINES, BY HORSE-POWER RATING—1912, 1907 AND 1902

Class of Stations	Engines Grouped According to Horse-Power			
	500 Hp or Under	Over 500 and Under 2000 Hp	2000 and Under 5000 Hp	5000 Hp and Over
Total 1912	1,091,370	978,551	845,381	2,031,230
1907	1,035,583	661,746	407,695	522,426
1902	849,336	381,055	149,550	*
Commercial, 1912	795,351	904,288	808,997	2,031,230
Municipal, 1912	296,019	74,263	36,384	.....
Steam engines:				
Total 1912	1,037,655	508,373	240,794	105,254
1907	1,018,566	489,694	186,280	115,509
1902	849,336	381,055	149,550	*
Commercial 1912	752,702	486,833	240,794	105,254
Municipal, 1912	284,953	21,540	.....	.....
Steam turbines†:				
Total 1912	53,715	470,178	604,587	1,925,976
1907	17,017	172,052	221,415	406,926
Commercial, 1912	42,649	417,455	568,203	1,925,976
Municipal, 1912	11,066	52,723	36,384	.....

*Included in "2000 and Under 5000 Hp." The class "5000 Hp and Over" was not called for at the census of 1902.
†Steam turbines were included with steam engines in 1902.

Water-Power Development

The development of water-power is shown by Table III. The total water-power of commercial and municipal electric central stations increased from 438,472 hp in 1902 and 1,349,087 hp in 1907 to 2,471,081 hp in 1912. The increase in the decade was 463.6 per cent. In the two later census periods waterwheels and water turbines contributed approximately one-third of the total primary power of central stations. The great increase was in the large units. The total rating of water turbines of 5000 hp or more increased from 1907 to 1912 222 per cent. Of the total horse-power rating of waterwheels and turbines in 1912, commercial stations had 94.7 per cent and municipal stations 5.3 per cent. The census returns show that water-power was used for the generation of electrical energy in all states excepting Kentucky, Louisiana, Mississippi, North Dakota and the District of Columbia. Including the returns from electric railways the rating of all waterwheels increased from 1907 to 1912 104.2 per cent. The water-power reported for New York, California, South Carolina, Pennsylvania, Michigan and Montana combined was 60 per cent of the total for the United States. Water-power was reported as used by 1035 central stations in 1912, and of these 496 reported having only water-power. Of the latter number 225 stations reported water-power each of 1000 hp or more. These were tabulated separately in the census returns as representing the hydroelectric stations. Their cost of construction and equipment was $922,954,341 and their total income was $72,717,582. These stations form only 4.3 per cent of the total number of central stations, but they reported 42.2 per cent of the aggregate horse-power, 92.6 per cent of the water-power, 38 per cent of the dynamo capacity, 50.8 per cent of the kilowatt-hour output, 31.1 per cent of the horse-power of stationary motors, 42.4 per cent of the cost of construction and equipment, and 24.1 per cent of the income. That much of the business of these plants is the sale of energy in bulk is indicated by the fact that they had only 12.4 per cent of the arc lamps and 17.5 per cent of the incandescent lamps. They reported 46 per cent of the total income for energy sold to other public service corporations.

Internal combustion engines were reported for 713 central stations in 1912 as compared with 294 in 1907 and 101 in 1902.

TABLE III—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—WATERWHEELS AND TURBINES, BY NUMBER AND HORSE-POWER RATING—1912, 1907 AND 1902

Class of Stations	Machines Grouped According to Horse-Power			
	500 Hp or Under	Over 500 and Under 2000 Hp	2000 and Under 5000 Hp	5000 Hp and Over
Total 1912	333,795	594,440	448,769	1,094,086
1907	320,636	357,671	330,980	339,800
1902	174,559	156,613	107,309	*
Commercial, 1912	298,674	554,100	441,969	1,046,086
Municipal, 1912	35,121	40,340	6,800	48,000
Per cent of increase:				
Total 1902-1912	91.2	279.6	318.2	.....
1907-1912	4.1	66.2	35.6	222.0
Commercial, 1902-1912	81.0	257.5	311.9	.....
1907-1912	0.7	55.8	35.3	207.9
Municipal, 1902-1912	266.7	2,359.8	.....	.....
1907-1912	46.7	1,917.0	54.5	.....

*Included in "2000 and Under 5000 Hp." The class "5000 Hp and Over" was not called for at the census of 1902.

Manufacture of Oxygen Gas at Kansas City

Next door to a substation of the Kansas City (Mo.) Electric Light Company the Oxygen Gas Company has been operating a forty-cell electrolytic-process oxygen-gas factory for more than a year. Direct current at 110 volts is supplied to the oxygen company in considerable quantities, the factory operating twenty-four hours a day. In the accompanying table are indicated the amounts of energy which have been required for the electrolytic process and the amounts taken by two 5-hp motors used for compressing the gas. During the summer and fall, according to statements made by the plant operator, about twenty-six 100-cu. ft. tanks of gas have been made daily, indicating that the specific energy consumption—that is, the number of kilowatt-hours used per cubic foot of gas—fluctuated between 0.5 and 0.55. No use is made of the hydrogen gas, which is given off with the oxygen. A pipe is provided through which it escapes up an unused chimney.

DATA IN OXYGEN-GAS MANUFACTURE

	Energy Used in Electrolytic Process, Kw-hr.	Energy for Motors, Kw-hr.
November	16,770	476
December	19,930	575
January	17,310	502
February	26,190	738
March	10,340	579
April	36,910	1003
May	34,900	1332
June	34,740	1398
July	35,940	1517
August	40,680	1516
September	37,490	1375
October	33,990	1599

An account of the manufacture of oxygen gas by factories in St. Louis using the electrolytic process was printed in the Electrical World for Dec. 26, 1914.

DIGEST OF ELECTRICAL LITERATURE

Generators, Motors and Transformers

Air-Gap Flux Distribution in Dynamo-Electric Generators.—ALFRED STILL.—A method of designing electric machinery—whether continuous-current or alternating-current generators—which involves the plotting of the flux distribution curves has much to recommend it not only to the student but also to the professional designer. The author's discussion is based on earlier work of W. E. Goldsborough and Charles R. Moore. But the method of deriving the curves giving the distribution of mmf over the armature surface is original with the present author. The subject is discussed under the following headings: Air-gap flux distribution with toothed armatures; correction for taper of tooth; variation of permeance over pole pitch; effect of neighboring poles; open-circuit flux-distribution curves as influenced by tooth saturation; effect of armature current in modifying flux distribution; armature mmf in polyphase generators; armature mmf curve of single-phase alternator; predetermination of flux curve in high-speed alternators with distributed field winding. The general advantage of the study of the flux distribution by plotting curves lies in the fact that new types of machines, or radical departures from existing types, can be designed, and their performance predicted, without reference to empirical formulas or test data, the application of which would be a difficult matter for the designer.—*Journal Franklin Institute*, January, 1915.

High-Voltage Dangers in Transformers.—J. LINDSEY THOMPSON AND S. AUSTIN STIGANT.—The first part of an article on the presence of high-voltages on the low-pressure windings of static transformers. This danger is the direct outcome of operating conditions in conjunction with the electrostatic capacities of the windings to the core and also to one another. The author first discusses single-phase transformers and three-phase transformers. The article is to be continued.—London *Elec. Review*, Jan. 1, 1915.

Lamps and Lighting

Temperature Distribution in an Incandescent-Lamp Filament in the Neighborhood of a Cooling Junction.—A. G. WORTHING.—The filaments of incandescent lamps are subject to end losses which result from the cooling effects of supports. These losses are sometimes of considerable magnitude and must be determined if it is desirable to study certain of the properties of the filament. The variations existing near such a cooling junction may, indeed, afford the opportunity for the convenient measurement of certain other properties, such as the thermal conductivity or the Thomson electromotive force. A knowledge of the temperature distribution in such cases is of considerable value. After outlining the theoretical considerations, the author describes his experiments, in which he used the Holborn-Kurlbaum optical pyrometer. The arrangement is shown in Fig. 1, in which *A* is the background, *B* objective lens, *C* entrance cone diaphragm, *D* pyrometer filament, *E* eyepiece diaphragm, *F* eyepiece, *G* monochromatic glass filter. The filaments studied were of tungsten mounted as U-shaped loops in evacuated bulbs. The lamps, which were well aged in order to remove gases, were installed at *A*. The necessary measurements consist in balancing in brightness the pyrometer filament *D* against the background filament *A* in the neighborhood of the cooling junction as that filament, heated to incandescence by a constant current, is raised or lowered. With exactly the same arrangement of apparatus, excepting that a black body is substituted at *A* and is operated at various temperatures, a calibration of the pyrometer-filament current as a function of the black-body temperature of the background was then obtained. Then with the aid of a black-body temperature—true temperature calibration of the background filament, taking account of the glass of the bulb of the lamp placed at *A*—one easily ascertains the surface temperature distribution along the filament placed at *A*. An exponential series relation between surface temperature and distance was found. How nearly this represents the distribution experimentally obtained in a particular case may be seen from Fig. 2. The solution is applied to a special case.—*Physical Rev.*, December, 1914.

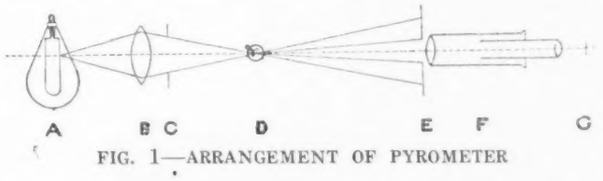
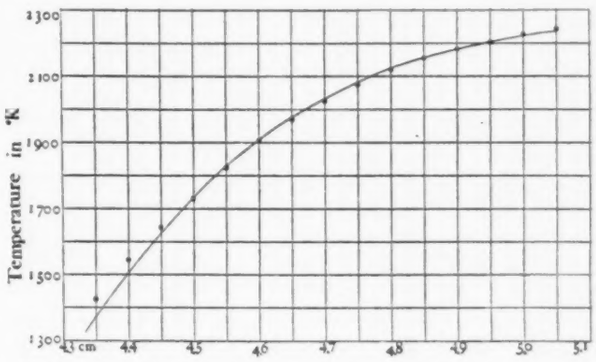


FIG. 1—ARRANGEMENT OF PYROMETER



Distance along the filament in cm. from an arbitrarily chosen zero.

FIG. 2—RELATION BETWEEN TEMPERATURE AND DISTANCE

Train Lighting.—EMIL DICK.—The conclusion of his illustrated article on the simplified Dick system of electric lighting of railway cars.—*Elek. Zeit.*, Dec. 3, 1914.

Generation, Transmission and Distribution

Induction Coils and Condensers as Protective Devices. E. PFIFFNER.—When induction coils and condensers are used as protective devices on transmission lines, they reflect the traveling waves back on to the line. Campos and Ruedenberg have recently urged that the protective device should contain an element in which the energy of the traveling wave is changed into heat and thereby made harmless. Ruedenberg concludes that the ideal protective device would be a combination of a self-induction and a capacity with a resistance. The present author shows, however, that if an ohmic resistance is connected in parallel to a self-induction the latter loses its most valuable property as a protective device; that is, its ability to flatten the steep front of the traveling wave. The resistance increases only slightly the natural damping of the traveling waves on the transmission lines. Another proposal of Campos and Ruedenberg was the use of an ohmic resistance in the condenser circuit. The present author points out that such a combination is entirely unsuitable since the effectiveness of the condenser is due to the fact that it represents a short-circuit in the first moment when the traveling wave arrives, as it represents in general

a very small resistance to high frequencies. The use of a resistance in series with the condenser, of course, destroys this desirable result. The author concludes that this combination is not only useless but dangerous. —*Elek. Zeit.*, Dec. 10, 1914.

Energy Transmission by Single-Core Conductor Cables. —C. F. PROOS.—In large cable transmission systems the use of single-conductor cables is becoming necessary since three-phase cables can at present hardly be built for more than 30,000 volts. With a single-conductor cable the magnetic flux of the current in the conductor induces voltages in the lead sheath. With large distances and an insulated lead sheath the voltage difference between the lead sheath and the surrounding ground may become appreciable. In order to maintain this potential difference within safe limits, the lead sheaths of the two cables of a line may be connected together

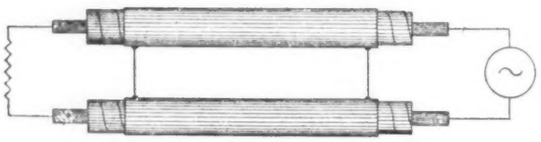


FIG. 3—CONNECTION OF CABLES

either directly or through a resistance both at the beginning of the line and at the end of a line, as shown in Fig. 3. But this method changes the characteristic constants of the transmission line. The author describes a simple graphical method by means of which the new characteristic constants of the line may be determined.—*Elek. Zeit.*, Dec. 17, 1914.

Installations, Systems and Appliances

London Electricity Supply.—Particulars have been published of a bill promoted by a number of the supply companies in London—whether in opposition to the scheme of the London County Council or to fill a niche provided in this scheme remains to be seen. The capital of the proposed company is $30,000,000 and it is the intention to transfer and vest in this company the undertakings of ten existing companies, among them a number of the most powerful companies, but not all of them. The area affected is very large, being in some respects more extensive than that of the London County Council, for it includes the whole of the administrative county of London and also portions of other counties. The dividend on the ordinary stock is limited to 8 per cent per year, a proportion of profits is to go to reducing the charges to consumers, and the undertaking is to be subject to purchase by the London County Council at the expiration of fifty years.—London *Electrician*, Jan. 1, 1915.

Wires, Wiring and Conduits

Substitution of Iron for Copper Wires in Germany.—An announcement of the German Association of Electrical Engineers, signed by the secretary, G. Dettmar. Since on account of the war the imports of copper into Germany are restricted, it is recommended to use iron wires instead of copper wherever possible. This is especially the case for uninsulated overhead lines, since long lines will hardly be built now in Germany. For direct current the conditions of the use of iron are rather simple, while for alternating current they are complicated by the skin effect and the increase of impedance. A list of references to literature on the subject is given. For iron wire with a tensile strength of 40 kg per sq. mm and steel wire with 80 kg per sq. mm the following values may be assumed in general: Specific resistance, iron wire 0.126, steel wire 0.204; conductivity, iron wire 7.9, steel wire 4.9; specific weight, iron wire 7.7, steel wire 7.9. The temperature coefficient is about 0.0046. The Felten & Guilleaume Carlswerk gives the tabulated values of the conductivities of its iron wires in thicknesses from 1 to 5 mm diameter for 15 deg. C. The first row gives the conductivities, the second gives them in per cent of the conductivity of copper. The increase of resistance, due

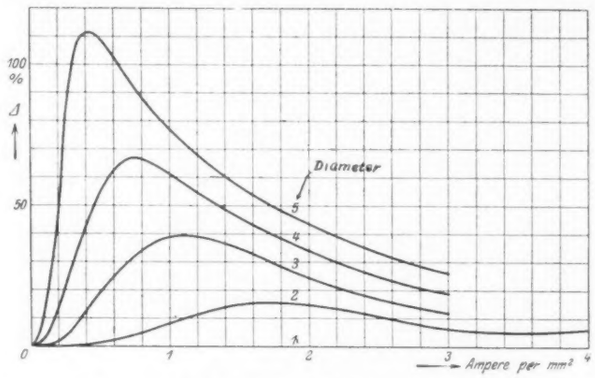


FIG. 4—CURVES SHOWING INCREASE OF RESISTANCE

to skin effect at a frequency of fifty, is shown in the four curves of Fig. 4. The ordinates give the percentage increase of resistance, the abscissas the current density in amperes per square millimeter. The four curves refer to wires 2, 3, 4 and 5 mm in diameter, respectively. A few data on stranded wires are also given. Some results of tests made by the Allgemeine Elektricitäts Gesellschaft with steel-wire ropes with a tensile strength of 120 kg per 0.9 mm are given in Fig. 5. The ropes were tested with direct current and alternating current, and in each case the voltage drop was determined. The temperature of the testing

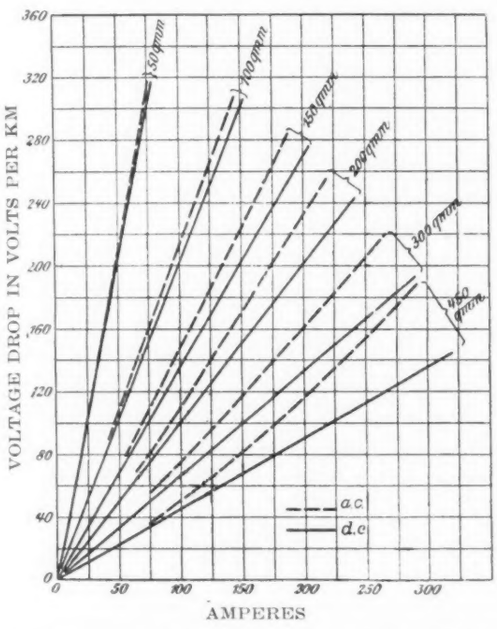


FIG. 5—RESULTS OF TESTS WITH STEEL-WIRE ROPES

room was from 16 deg. to 20 deg. C. Fig. 5 gives the voltage drop per kilometer as function of the current for 50, 100, 150, 200, 300 and 450 sq. mm diameter, respectively. The dotted lines refer to alternating current, the drawn-out lines to direct current. To prevent rusting, the wires must be well zinc-plated or tinned. The cross-section is determined in many cases

by the voltage drop. If this is not the case, it is recommended to make the iron cross-section two and one-half or three and one-half times that of the copper cross-section required. Of great importance is proper joining

VALUES OF CONDUCTIVITIES FOR IRON WIRES

Soft Steel (Zinc-Plated or Tinned)						Bessemer Steel (Zinc-Plated or Tinned)	
G. S. soft, 37 kg	H_{000} soft, 40 kg	H_{000} hard, 70 kg	H_{00} soft, 40 kg	H_{00} hard, 70 kg	HF I hard, 70 kg	HT IVp, blue, 95 kg	HT IVp, hard, 120 kg
9.98	8.87	8.81	7.77	7.34	6.11	5.61	5.95
16.80	14.80	14.70	12.90	12.20	10.20	9.40	9.90

of the iron wires to existing copper wires.—*Elek. Zeit.*, Dec. 10, 1914.

Electrophysics and Magnetism

Theory of the Metallic State.—F. A. LINDEMANN.—A theoretical paper in which the author shows that the free electrons in a metal may not be treated as a gas, for a gas can conduct heat well only when its heat capacity is large. Experiment proves that the free electrons conduct heat well but that their heat capacity is too small to be measured. The assumption of a large free path to compensate a small number leads to contradictions with the optical properties of metals. It is suggested that the free electrons in a metal form a space lattice, which corresponds to a crystal at a very low temperature, as the small mass of the electrons leads to a high frequency. The point of view from which this theory would explain the various metallic phenomena is indicated. Although it explains the exceptional behavior of alloys and the general outlines of the photo-electric effect, special assumptions are needed to arrive at the Wiedermann-Franz law. The contradictions entailed by the old theory do not arise.—*Philos. Mag.*, January, 1915.

Magnetic Field of an Atom in Relation to Theory of Spectral Series.—H. STANLEY ALLEN.—A theoretical paper in which the author shows that the core of an atom gives rise not only to an electrostatic field varying inversely as the square of the distance from the center, but also to a magnetic field such as would be set up by an elementary magnet. The steady states of motion of an electron in the field of the atom are determined by the ordinary laws of electro-dynamics, combined with specified assumptions as to the angular momentum and the energy of the electron. The energy of the radiation, as in Bohr's theory, is given out in quanta, which represent the differences between the energies in two steady states of motion. When, however, the numerical value of the appropriate constants in the formula of Ritz is considered, it is found that the magnetic forces set up by the atom are not in themselves sufficient to account for more than a small fraction of the effect that would be necessary to give the observed distribution of lines in the spectral series.—*Philos. Mag.*, January, 1915.

Electrochemistry and Batteries

Electrostatic Measurements of Single-Electrode Potentials.—A. W. EWELL.—An abstract of an American Physical Society paper. Determinations of the absolute values of single electrode potentials have often been sought from electro-capillary phenomena, "dropping electrodes," endosmotic phenomena, etc. Considerable uncertainty attaches to the values obtained. Recent work by Billitzer gives values for electrode potential approximately 0.7 volt lower than the absolute values commonly given in tables. The writer has been seeking for several years to obtain absolute single electrode potentials by an electrostatic method. The final apparatus, in brief, consisted of a glass or quartz flask covered on the outside with metal which is connected to a Dolezalek electrometer. The flask contained the electrolyte, and from the change of potential of the metal outside was determined the potential acquired by the electrolyte when the earthed electrode was dipped into the electrolyte. Observations with zinc and zinc sulphate, copper and copper sulphate, silver and silver nitrate, with glass and quartz flasks, and silver and aluminum films on the outside, all gave values for the absolute single potentials which are consistent among themselves and are about 0.2 volt higher than Billitzer's values, that is, approximately 0.5 volt lower than the values found in recent tables. Errors from leakage and from conduction through quartz or glass were easily detected and corrected. Volta effects were proved to be zero by the substitution of mercury for the electrolyte.—*Physical Rev.*, December, 1914.

Units, Measurements and Instruments

Adjustment of Induction Coils.—E. TAYLOR JONES.—The author has formerly shown that the secondary potential and spark length developed by an induction coil when a given current is interrupted in the primary circuit are greatest under the following conditions: First, the ratio n_2/n_1 of the two frequencies of electrical oscillation of the system should have one of the values 3, 7, 11 . . . ., and, second, $L_1C_1 = (1-k^2)\,L_2C_2$. The first is the condition that maxima of the two potential waves in the secondary circuit should occur simultaneously, the second that the sum of the amplitudes of the two waves should be a maximum for a given value of k. The most effective of the ratios is $n_2/n_1 = 3$, and in this case the conditions are satisfied by the adjustment $k=0.756$, $L_1C_1 = 0.429\ L_2C_2$. The physical meaning of these results is further considered, and it is shown that any induction coil in which the coupling is greater than 0.756 can be improved in spark length by connecting external series inductance in the primary circuit so as to reduce the coupling to this value. An induction coil should not be constructed so that the coupling is less than 0.756, for there is no convenient way of increasing the coupling to this value. Nor should the coupling coefficient of the primary and secondary coils have precisely this value, though if no external coils are used this is the best arrangement. Better effects are obtained by coupling the coils more closely than this and adding series inductance to the primary circuit so as to reduce k to this value. The ratio L_1/C_2 is thereby increased, and it is upon this quantity, when the chief adjustments are effected, that the maximum secondary potential for a given primary current chiefly depends. Another experiment is described as to the working of an induction coil when in its most effective adjustment. The experiment consisted in increasing the self-inductance of the primary circuit by the addition of air-core coils, and varying the capacity of the condenser, until the longest spark was produced by a given primary current.—*Philos. Mag.*, Jan. 1, 1915.

Meter.—An official communication of the Reichsanstalt by which the magnetic motor meter for direct current of Landis and Gyr is admitted for calibration. The principles of operation, construction and calibration are described and illustrated.—*Elek. Zeit.*, Dec. 10, 1914.

Meter.—An official communication of the Reichsanstalt admitting for calibration a single-phase induction meter of the Danubia company. The construction is described and illustrated and the methods of operation and calibration are explained.—*Elek. Zeit.*, Nov. 5, 1914.

Telegraphy, Telephony and Signals

Manual Service in Large Telephone Exchanges.—W. PINKERT.—A discussion of the telephone system in use in Hamburg and a comparison with American practice. The author concludes that of all systems of manual service in telephone exchanges the American A-B system and the Hamburg system are the best for a large telephone system. However, even these two systems have some shortcomings which may partly be overcome by suitable technical and administrative devices.—*Elek. Zeit.*, Dec. 10 and 17, 1914.

Logarithmic Decrements.—LOUIS COHEN.—The Bjerknes method of determining the logarithmic decrement of the secondary of two coupled circuits is critically discussed. The author suggests a new method for determining this decrement. An additional known resistance is inserted in the secondary (or resonant) circuit, instead of in the primary circuit as is the case in the Bjerknes method. An expression for the logarithmic decrement of the secondary circuit in terms of the logarithmic decrement of the primary, and known or measurable quantities, is given. The practical application of the method is described.—*Proceedings*, Institute of Radio Engineers, September, 1914.

Artificial Telephone Line.—G. M. B. SHEPHERD.—An illustrated article on an artificial equivalent of an open-wire line of 200 miles length for telephone experiments.—From the (British) Post Office Electrical Engineers *Journal*, reprinted in abstract in London *Electrician*. Nov. 27, 1914.

Transmitting Signals to a Distance.—E. GOLDBACHER.—The conclusion of his illustrated description of the electric signal apparatus for the heating and ventilation systems of a hospital in Vienna. In the present instalment the method of indicating in the office the humidity at different points in the building and the various electric control arrangements are described.—*Elek. u. Masch* (Vienna), Nov. 1, 1914.

Miscellaneous

Australia.—Statistical tables of the imports of electrical and allied goods into Australia during the year 1913, with a comparison with the preceding year. Attention is called to the footing which the United States has gained in the trade. Although among the figures under review there are some noticeable declines in the United States' share, these are not important when considered in relation to the general decline.—London *Elec. Review*, Jan. 1, 1915.

Expiring British Patents.—A list of patents of interest to electrical engineers which will expire during 1915.—London *Electrician*, Jan. 1, 1915.

Book Reviews

AMERICAN HANDBOOK FOR ELECTRICAL ENGINEERS. By Dr. Harold Pender. London: John Wiley & Sons, Inc., 2024 pages, illus. Price, $5.

Were it not that the treatment of the subjects included in this handbook is somewhat different from what we have been accustomed to in the handbooks of established reputation, and that some new features have been included, the question of the necessity or desirability of publishing yet another reference handbook for electrical engineers would naturally arise. After very carefully examining this new book, the reviewer has come to the conclusion that the vast expenditure of time and effort which has obviously been devoted to its preparation will probably be justified by results. No practising electrical engineer, whatever the line of work he may follow, can afford to be without a handbook of this description for occasional reference, and with the advent of the American Handbook for Electrical Engineers there will now be in this country three publications of the first rank from which the engineer can select the one best suited to his needs. The ground covered by this book is considerable, as an attempt has been made to include not only the electrical field but also other engineering subjects closely allied to electrical enginering. The result is a book of 2024 pages in which the limit of size so far as thickness is concerned appears to have been reached. It is not suggested that the articles on purely electrical subjects are too long, but it is perhaps questionable whether some of the material, such as steel structures (forty pages), reinforced concrete, and similar articles, might not have been omitted or treated more briefly. The most striking feature of the book is probably the arrangement of the articles in alphabetical order. This, at first sight, appears to be a desirable, and indeed a rational, departure from the usual method of treating the various branches of engineering in different sections; but until the reader has become thoroughly familiar with the headings to the articles he will not reap the full benefit of the alphabetical arrangement, as he will have to refer very frequently to the index at the end of the book. The reviewer does not understand why, if the alphabetical arrangement is adopted, it should not be carried out thoroughly as in a dictionary or encyclopedia, which is not furnished with an index simply because the book itself is its own index. Selecting a few words at random, such as "cables," "coal," "dynamo," "magnet," there are no articles under these headings, and the reader is compelled to refer to the index in order to find the titles under which these items are dealt with. It would surely enhance the value of the book without increasing its bulk if the index formed part of the body of the book instead of forming an appendix to what is nearly, but not quite, an alphabetically arranged encyclopedia of electrical engineering. Two commendable features are the attention paid to cost items and the bibliography with which every article is concluded. Without wishing to criticise in detail the features of a publication which as a whole is excellent, it must be said that the references to books and papers which conclude the various articles appear to be based largely on the particular author's acquaintance with the publications referred to, thus leading to the omission of many important writings with which he does not happen to be familiar. It is, of course, practically impossible, and indeed undesirable, to include a complete bibliography, but some systematic and less haphazard method of selecting suitable references might have been followed with advantage. In conclusion, the excellent work done by Dr. Harold Pender and his assistants as editors is seen throughout the book. It has led to a systematic treatment and arrangement of all articles, which must inevitably be of the greatest value to the reader once he has become familiar with the general plan upon which the work as a whole has been based.

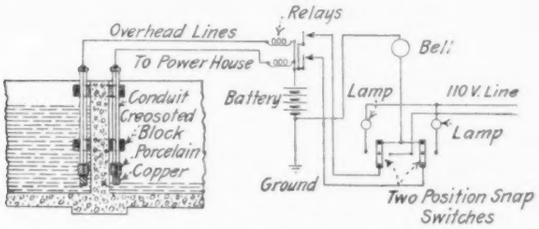
STANDARD WIRING FOR ELECTRIC LIGHT AND POWER. Twenty-first edition. New York: H. C. Cushing, Jr. Pocket size, leather cover, 320 pages. Price, $1.

In addition to the revised explanation of the rulings of the National Board of Fire Underwriters embodied in the latest edition of the National Electrical Code, the present edition of Cushing's manual contains a new chapter of fifty pages on house wiring in the preparation of which the publisher received the co-operation of the N. E. L. A. committee on the wiring of existing buildings. The book has been adopted also by the Society for Electrical Development, Inc.

POWER AND OPERATING SECTION

Low-Water Alarm

In the accompanying sketch is shown a closed-circuit, low-water alarm installed at the Chicago, Rock Island & Pacific Railway Company's shop at Silvis, Ill. The necessity of a very dependable alarm arose when a two-compartment settling basin was built and a steam pump was installed in the power house for raising the



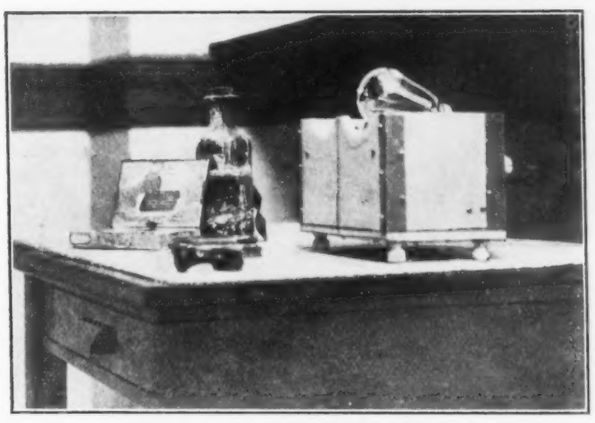
ARRANGEMENT OF LOW-WATER ALARM

water from this basin to a high service tank. Although the water-level gage was visible from the boiler-room window, it was considered unsafe to depend on the fireman in charge to watch this gage as a signal to stop the pump when the water became too low.

The path of the continuous relay current is from the copper terminal to the ground through the water. In case the water in either compartment becomes low enough to leave the copper terminal, the respective relay is de-energized, thereby ringing the alarm bell in the boiler room. If either compartment is to be left empty any length of time for repair or washing, the bell can be silenced by means of the two-position snap switch, which lights a lamp to indicate that the alarm is not in circuit for that compartment. This change does not interfere with the working of the alarm on the other half of the reservoir.

Improved Method of Etching Lamp Bulbs

The accompanying halftone illustrates the method employed by the Hartford (Conn.) Electric Light Company in etching dates upon its incandescent lamp bulbs before delivering them to customers. As is the usual



METHOD OF ETCHING LAMP BULBS

practice, this is done by a rubber stamp and a dilute solution of hydrofluoric acid, but in place of the Bunsen burner ordinarily employed the bulb is warmed before the application of the etching stamp by an electric heater on which the bulb is placed for a few seconds. The heater consists of two 250-watt elements mounted in a box insulated with $\frac{3}{8}$ in. of asbestos wood, the transmission of heat being through two iron castings coming close to the lamp when the latter is being warmed. The box is 10 in. long, 6 in. wide and 6 in. deep and is mounted on porcelain knobs to provide an air space between it and the asbestos-covered table on which the work is done. The cost of the castings was 36 cents; of the two units, $2.50; of the asbestos wood, $1, and about one day was required to build the device, making the total expense about $6. With this apparatus 250 lamps per hour can be lettered, and there is no comparison in safety as against the alcohol lamp or gas burner generally used, both of which are slow, dirty and hard to regulate in comparison with electric heat.

An Installation of Reverse-Energy Relays

BY A. R. HAYNES

A large power company in the Northwest recently installed instantaneous single-phase reverse power relays at the receiving end of two transmission lines normally operated in parallel. The transmission lines are three-phase with isolated delta. Two relays were used on each line and the usual wiring for this case is shown in Fig. 1. It will be noted that the potential coils are to be connected from the middle points C and D of the potential transformers to the open-delta end of the others, thus giving a phase displacement of 30 deg. and bringing the current and potential in each relay itself in phase for 100 per cent power-factor three-phase.

This is shown in Fig. 2 where E_a and E_b are parallel to, that is, in phase with, currents I_1 and I_2 respectively. The power setting is therefore definite as with single-phase circuits and uninfluenced by the power-factor of the three-phase line.

In this installation, however, the expense of bringing out the middle points of the potential transformers and

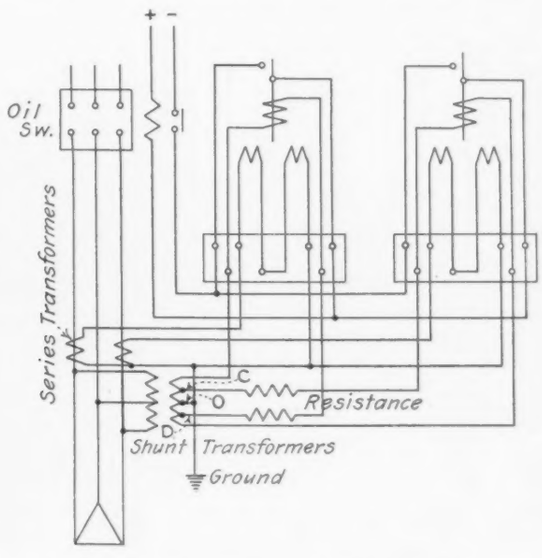


FIG. 1—SWITCHBOARD CONNECTIONS

wiring, as in Fig. 1, was prohibitive. The relays were therefore wired from the potential resistances to the point O (Fig. 1). Each relay consequently behaved as a single-phase wattmeter on a three-phase circuit and the line power setting varied with the power-factor of

the line. Curve 1 in Fig. 3 shows how the torque in each relay varies with the line power-factor. Curve 2 shows how the reverse power to trip the relay with the

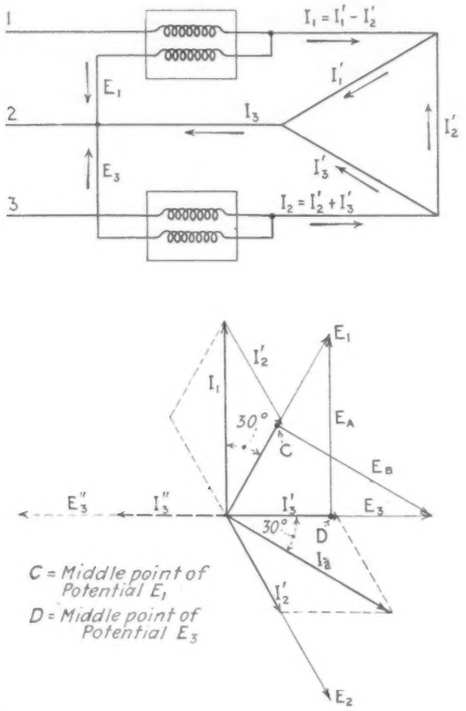


FIG. 2—DIAGRAM FOR THREE-PHASE UNITY POWER-FACTOR

higher torque falls off with the line power-factor. This effect was noted while setting the relay.

Shortly after putting the relays in service, one of the transmission lines opened up while the generating station was shutting down, and it was concluded that

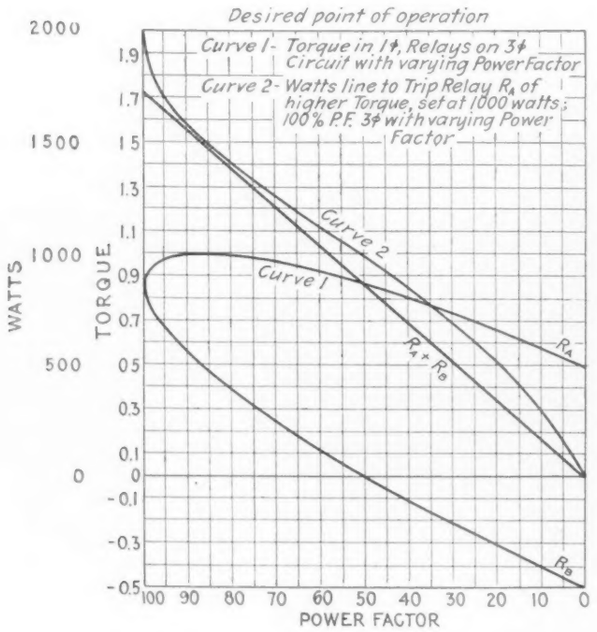


FIG. 3—RELATION OF POWER-FACTOR TO TORQUE

this was due probably to a heavy current of low power-factor just before the last generator was to be cut off the line.

It was decided, therefore, to connect the two moving elements of the relays on each line together mechanically, thereby obtaining a polyphase action, which, of course, is independent of the line power-factor. This is now being done and no further trouble is to be expected.

Lamp Issuer's Test Socket

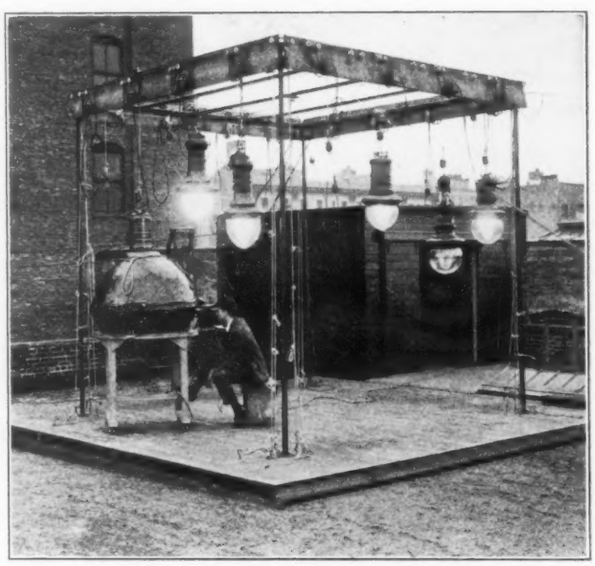
An ordinary lamp socket which has been converted so that a lamp can be quickly inserted therein without screwing it into place is being used in the incandescent lamp-issuing department of the Public Service Electric Company of New Jersey at Newark for test-

LAMP SOCKET FOR TESTING PURPOSES

ing the continuity of lamp filaments prior to issuing the bulbs. To facilitate the speed at which lamps can be so tested the threaded sleeve ordinarily forming one of the lamp contacts in the socket has been replaced by spring-brass fingers which slip over the lamp base when it is inserted. These afford sufficient contact to carry the current required by most lamps. For convenience the test socket is attached to a goose-neck condulet over the lamp issuer's counter.

Outdoor Arc-Lamp Testing Equipment

For testing street-type arc lamps under actual service conditions the outdoor rack and portable integrating sphere shown in the accompanying illustration are employed at the Electrical Testing Laboratories, New York City. The rack, which is situated on the roof of the laboratory building, will accommodate eighteen series lamps. Each lamp is connected so that it can be cut out



TESTING ARC LAMPS UNDER OPERATING CONDITIONS

of circuit by removing a porcelain jack attached to the rack above the lamp. During mean spherical candle-power tests each lamp is lowered into a 40-in. integrating sphere the accuracy of which has been verified by comparing results obtained with it with those secured

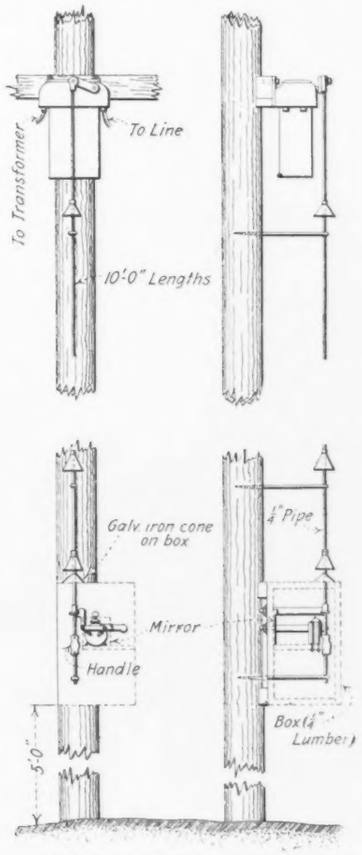
by three other standard methods. When the sphere is not being used it is rolled into the compartment shown at one side of the rack.

The rack is made of four vertical iron pipes supporting a horizontal iron pipe frame around the edges of which are attached the series wiring, porcelain-plug cutouts and lamp-support pulleys. Ropes supporting each lamp pass over these pulleys and thence over pulleys at each corner of the rack to hooks in the platform.

Time Switch for Series-Tungsten Street-Lighting System

By J. P. BYRON

In many of the smaller towns served from its circuits the Washington Water Power Company of Spokane is using the Pittsburgh system of series tungsten lighting for the streets. The company found it necessary to devise some convenient way of switching the lamps on at night and switching them off again in the early morning, and as all apparatus used in this system of street lighting is of the outdoor type, it installed a double-pole single-throw pole-top oil-break switch as shown in the engraving. This switch in most cases is installed 30 ft. from the ground in the primary circuit of the transformer. For operating the switch a "Big Ben" alarm clock is used. The operating arm of the oil-break switch was changed to the position shown, the wooden handle was removed, and a ¼-in. pipe was attached to the operating arm. This pipe-operating rod



ARRANGEMENT OF TIME SWITCH

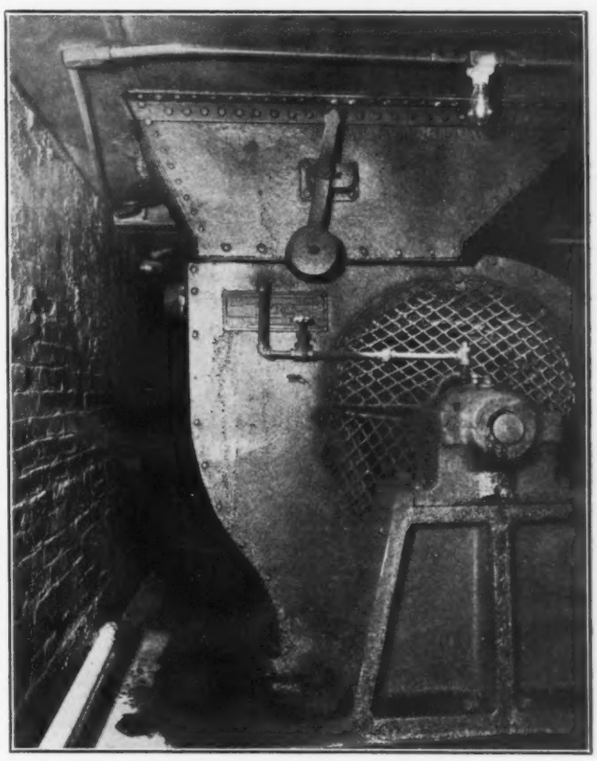
extends down the pole through guides to the operating mechanism, which is placed in a box about 6 ft. from the ground.

This latter mechanism consists of an anchored pawl held vertical by a toggle anchored at the extreme right. The switch is held in its closed position by a collar on the operating rod resting on the pawl, which is held in position by the toggle. When the alarm, set for a given time, goes off, the cam on the alarm key breaks up the toggle, thereby permitting the pawl to release the collar, whereupon the operating rod drops, thus pulling down the switch-operating arm and opening the switch. In closing the switch the attendant uses the handle on the rod and at the same time resets the cam which has been stopped at one-half turn by a stop. This cam must be reset before the switch can be left closed, and a mirror is provided to guide the attendant in setting the hands on the clock.

The cone-shaped bonnets on the operating rod just above the guides are intended to protect the latter from ice forming in them. The Washington Water Power Company has a number of these switches in use which have gone through the winter of 1913 and 1914, and thus far the company has not experienced any trouble whatsoever with them.

Unbalanced Damper for Preventing Back Feed

Under the hand-fired furnaces at the Gold Street generating station of the Edison Electric Illuminating Company of Brooklyn are automatically controlled turbine-driven blowers which discharge into a common air duct. To prevent air being fed back through any of these blowers an unbalanced damper has been placed in the discharge duct from each unit which automatically closes when the air is not being delivered to the main duct. The axis about which the damper swings is nearer one edge than the other, so that when the supply pressure rises above that in the main duct a resultant



AUTOMATICALLY CONTROLLED DAMPER IN BLOWER DUCT

torque will be produced which opens the damper. To prevent gravity closing the damper when the supply pressure decreases slightly a counterweight is attached to the shaft to bring the weights of the opposite halves of the damper nearly to an equality.

Water-Tight Cases Used in Havana Underground System

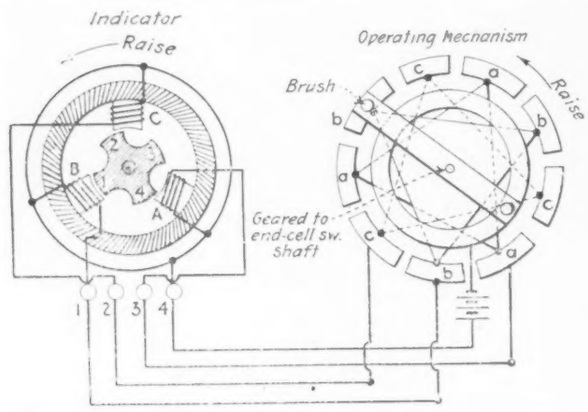
Wherever transformers are placed and wherever branches are taken from mains in the underground electrical distribution system at Havana, Cuba, cast-iron water-tight cases are used to shield the equipment from

WATER-TIGHT DISTRIBUTION BOX

the tropical moisture. The primary lighting lines of the Havana Electric Railway, Light & Power Company are operated at 6000 volts, and the secondary lines at 220 volts. The illustration herewith shows a workman opening up a water-tight case at a point where a secondary 220-volt line in the street is being tapped to provide service for more than one building.

End-Cell Indicator

The accompanying drawing shows the principle of operation of the end-cell indicators employed in the Pearl Street substation of the Edison Electric Illuminating Company of Brooklyn. The indicator mechanism consists of three electromagnets arranged with their axes 120 deg. apart in the same plane and intersecting at a common point. Attached to a shaft at right angles



END-CELL INDICATOR MECHANISM AND OPERATING SWITCH

to this plane is a four-pole soft-iron armature which can rotate past the inner poles of the magnets. On the shaft is a pinion which meshes with a gear moving the instrument pointer. One terminal from each electromagnet is attached to a common conductor which, together with the three remaining terminals of the coils, is connected with the operating switch as shown. Both the operating switch and indicator mechanism are constructed so that one complete revolution corresponds to a change of three cells.

With the indicator armature in the position shown the poles 2 and 4 are within 30 deg. of magnets *C* and *A* respectively, therefore as end cells are cut out or added one of these magnets must be energized first. For instance, if the arrows indicate the directions in which the switch and indicator are to turn with an increase in end cells the electromagnets will have to be energized in the order *A C B A*. With a reduction in cells the coils will be energized in the order *C A B C*. It can be seen by examining the drawing that while the coils are 120 deg. apart the armature never has to be drawn magnetically through more than 30 deg., so the air-gap is exceedingly small.

Removable Hatchway Guard in Substation

The handling of equipment in an industrial substation is greatly facilitated by the use of the removable railing illustrated in the accompanying halftone, surrounding a hatchway opening into a low basement containing cable outlets and wiring. The railing is of the usual pipe construction and is set into a flat frame

REMOVABLE HATCHWAY GUARD IN SUBSTATION

which ties the structure into a single unit, the outfit being light enough to be easily removed by hand when it is desired to handle equipment by overhead hoisting blocks with a free floor space in a rather narrow compartment. Planking laid over the hatchway protects the operator under these conditions.

COMMERCIAL SECTION

Merchandising for Profit

CONTRACTORS, jobbers, dealers and central stations doing a merchandising business begin to realize that much is to be learned from department stores whose experience with the public is of longer duration. Not only must show windows be so decorated as to possess selling force but the interior of the store must also be arranged with that end in view. The question of profit is, of course, a rock upon which many an enterprise has been wrecked. Inasmuch as unwarranted price cutting has been charged against central-station companies, the article by Mr. T. I. Jones printed elsewhere in this issue will help to clarify the situation. However, another situation also confronts the industry. Unless those engaged in the merchandising end of the business make an effort to obtain and to retain the trade which should legitimately be theirs, the business will fall into the hands of the department stores and hardware stores of the country. The sales of electrical merchandise become larger and larger every year, and the principles that make for success in other merchandising business also apply to the electrical trade.

Safety First in Wiring

IN connection with the progress on concentric wiring rules it has been suggested that at some future day the public will require that "safety first" principles be applied more rigorously to wiring methods. Although this is not imminent. it should not be disregarded. It is one of the possible developments which manufacturers should be prepared to anticipate. The safety first movement is so extensive that it now touches most, if not all, industries involving hazards to life or limb. Primarily it is a movement undertaken by the companies to reduce the hazards of employment or use of their service. No matter how much has been done to promote safety, ways of doing more will be devised. The development of safety measures is necessary and desirable but it can be carried so far as to interfere with operation. If trains were not run, no lives would ever be lost on railroads, but even the most conservative would not advocate abolishing them. To safeguard the use of electrical energy manufacturers will do well to bear in mind the public tendency toward safety measures.

Demand for Rural Service

REPLIES numbering 24,000 received to 55,000 letters sent out by the Secretary of Agriculture to the farmers of the United States show that running water is the one improvement most desired to make the farmer's home more attractive. Better household equipment, appliances to lessen labor, improved sanitation, and fire-fighting facilities were also specified. With electric service on the farm, all of these longings might be satisfied. The telephone, good roads and automobiles and rural free delivery have banished the pall of rural isolation, and with electric service in his home the farmer will be on a plane of independence, comfort and convenience far above his city brother. Letters and other data in the hands of the Department of Agriculture, as well as the experiences of progressive central-station companies, indicate that the farmer is willing to pay for such service. There are enough farms near existing circuits in the East which experience in the West would indicate would make profitable loads.

Electric Vehicles in Postal Service

AT a time when opportunities to install electric commercial vehicles are very rare on account of the prevailing conditions, manufacturers and others interested should take advantage of the occasion which now exists in over thirty cities in Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa and Missouri to secure the use of electric machines in postal service. The Post Office Department is now inviting proposals for service to begin July 1, 1915, when the existing contracts expire. Much missionary work has been done in this direction, the advantage and economies to be secured are clear and well defined, but the inclination of the uninformed is to proceed in other directions. Unless earnest and determined efforts are made to enforce the consideration of electric vehicles, the opportunity in the territory indicated will be lost for the period of four years.

Sidewalk Display Lighting

VERY little has been done as yet to develop the possibilities of display lighting on sidewalks beyond the marketing of small projector lamps and the occasional equipment of basement windows close to the street level with illuminated recesses in which small goods may be shown to advantage. There is a field of service here which the electrical advertising man will do well to cultivate. Cove lighting of basement windows can be done on a surprisingly small expenditure of energy if the window is lined with light-colored material, and the appeal of such displays to the eye is very strong. In the future more will be done along the lines of sidewalk transparency lighting, with terse, compelling sentences under the foot of the passer-by, illuminated from below through appropriately designed bull's-eye or other heavy glass. Even the coal-chute cover may discharge the functions of a display advertisement burning on the long-hour plan, and the opportunities to develop some

high-class directed illumination at or near the ground level are not to be scoffed at. Time was when the pasting of advertisements on the risers of elevated railway station stairs in large cities was looked upon as the height of boldness by visitors from less intense business centers, but to-day we are only on the threshold, so to speak, of a development in distinctive localized lighting which should yield large revenue to central stations and to merchants.

Economies of Electrical Heating

From time to time engineers have made careful studies of the economies of electric heating, but seldom through experiments on a sufficient scale to give a good practical idea of the situation. Electric heat applied for various minor purposes of utility has already proved successful and needs no comment. For certain particular work it has proved thoroughly practicable, as in heating of street railway cars. Some recent experiments bearing directly on the comparison between electric heating and heating by ordinary hot-water apparatus were carried out in one of the public buildings in Stockholm. The exposed surface dealt with was about 32,500 sq. ft. of a modern city building. The temperature for both electric and hot-water heating was held constant at 18 deg. C. (64.4 deg. Fahr.), so that the practical work done in each case was the same. The hot-water-heating equipment was fired with coke from the gas works. The electrical heating was carried out in two ways—first, through the entire day steadily, and, second, by shutting off heat at the close of business at 5 o'clock in the afternoon and turning it on again at 7 o'clock in the morning, so that the temperature remained at the proper height when the rooms were in use.

An interesting figure derived by the experiments was on the efficiency of the hot-water-heating system. Practically all of the heat which entered the circulating water was utilized, just as all the electrical energy delivered in the heating system is utilized. The electric heating has the advantage of less loss in the leads which reach the radiators, while in the hot-water system the real point at issue is the efficiency of the boiler in delivering heat to the water. When the pipes are well lagged the losses in the mains, so to speak, are small. When the electric heating was continuous through the twenty-four hours 198 kw-hr. were required as the equivalent of one hectoliter (2.87 bushels) of coke. In the case of discontinuous electrical heat 120 kw-hr. were equivalent to a hectoliter of coke, thus showing the characteristic advantage in electrical heating of instantaneous application and no loss in the banking of fires. As a comparative test of electricity and coke the data are complete. For the case making best use of the advantages of electric heating—that is, discontinuous work—the equality of cost would require 42 kw-hr. to be delivered at the price of a bushel of coke. With coke at 25 cents a bushel, a common enough price here, the results indicate that heating can be done with economy by electricity in competition with hot-water heat at practically any price under 0.6 cent per kw-hr. On the other hand, coke is used largely as a matter of convenience, and on account of its cleanliness and smokelessness commands a relatively high price. Assuming an efficiency of, say, 60 per cent in the heating apparatus, it is painfully evident that since a pound of high-grade coal should produce nearly 8000 heat units available for heating as against about 3400 units per kw-hr., the chance of electricity competing with hot water when coal is used as fuel is very remote.

Even taking full advantage of discontinuous working with electricity, one would still have to furnish nearly 2 kw-hr. for the price of a pound of coal to obtain an economical success. Therefore, unless the price of coal is very high, electric heating on any considerable scale is not commercially advantageous. We are inclined to think, however, that the case for electricity is better than it seems at first sight, since it is extremely doubtful whether the average heating apparatus in a house is even approximately 60 per cent, particularly in moderate climates where much fuel has to be wasted in banking. Probably 30 or 40 per cent more correctly represents the average, year in and year out, in small systems, so that cheap electric energy from hydroelectric sources still has a chance for success under favorable conditions.

Winter Uses for Electric Fans

Indispensable in summer time, the electric fan has also a number of useful applications during the cold months of the year. A fan in a show window will keep the plate glass clear of frost and attract purchasers to the store on days when the displays of neighboring merchants not so equipped are effectively concealed by icy crystals. Parts of a room remote from the means of heating can be made comfortable by arranging an electric fan to deliver warm air from the more favored section. In the same way a small steam radiator can be made to do the work of one twice its size by directing the draft of a fan onto its heating surface. By thus removing the heat and cooling the metal surface more steam will automatically enter the radiator and condense in its coils, thus increasing the effectiveness of the radiator. Where a room is insufficiently equipped with radiation the resulting discomfort on very cold days can be avoided by operating an electric fan for a few hours daily in this way. A fan also proves a useful adjunct to the old-fashioned system of heating by means of hot-air ducts. Where the flow of air through the ducts is not sufficient owing to its heat alone, the fan can often be used to advantage to create a strong artificial draft. Much valuable information relating to this use of the fan is contained in an article by Mr. Percy W. Gumaer in this issue. In addition to the saving effected in the coal consumption, the "forced-draft" arrangement possesses the invaluable advantage over the "induced-draft" arrangement of delivering the heat where it is most needed, namely, on the windward side of the house, the part always difficult, and sometimes practically impossible, to heat with the old-fashioned hot-air system.

Merchandising by Central Stations

Department-Store Methods Used in the Display and Handling of Electrical Appliances—Goods Sold at Average Profit of 30 Per Cent.

By T. I. JONES

THE rapid development of electrical appliances for household use has forced the attention of the management of central-station properties to a careful consideration of the best means for their exploitation and sale.

The sale of electric appliances by a central station may result in a twofold benefit to it:

First—The inducement which it offers to prospective customers to install electricity in their homes, with the consequent increase in the number of consumers and hence in kilowatt-hour sales.

Second—The profit which may accrue to the central-station company not alone from the sale of the goods *per se* but also from the sale of the energy which the various appliances use.

Until recent years only the first of these advantages was generally considered. Of late the value of selling the appliances for profit has had much consideration, and it is particularly with respect to that phase of the matter that this article is written.

Study of Principles

A careful study of the principles underlying the merchandising of electrical appliances reveals many points in common with the merchandising of stocks in a department store, and the methods applicable to the latter may be successfully employed in the sale of appliances.

The theory that the appliances sold can be disposed of only at a nominal profit for the energy which they may draw from the central-station system has been pretty much exploded by the selling facts which show advertising and publicity methods, capably applied, to have resulted in more sales at a satisfactory profit than when these goods were sold at a nominal figure.

Then, too, the sale of appliances by a central station must be conducted in a manner satisfactory to various other dealers in electrical supplies in the community, and to adopt a policy for appliance sales at merely nominal prices is not only no advantage, from a gross amount of sales standpoint, but it is positively harmful in killing that co-operation which the central station always should foster with the electrical contractor and the supply dealer.

Cost of Merchandising

The cost of merchandising electrical appliances follows pretty closely the cost of merchandising dry goods.

FIG. 1—ATTRACTIVE ELECTRIC SHOP OF BROOKLYN EDISON COMPANY

Inquiries sent broadcast throughout the country two years ago by the merchandising committee of the National Electric Light Association gave figures of particular interest, and an endeavor was then made to ascertain how much must be added to the actual cost of an appliance in order to arrive at a gross cost which might properly be used as a basis on which to calculate profit. A summary of the answers received showed that approximately 20 to 25 per cent is a proper figure to add to the cost of the appliance.

Department-store costs usually run about 27 per cent, electrical jobbers' about 20 per cent, as an average, so that it would appear, therefore, that if a central station is to do business on a profitable basis, with the

FIGS. 2 AND 3—SHOW WINDOWS OF BRANCH OFFICES OF THE BROOKLYN EDISON COMPANY

co-operation of the contractor, jobber and department store, it should first add at least 20 per cent to its cost price as its gross cost of marketing articles.

Now as to the profit. It would appear that the average dealer, working in co-operation with the central station, marks his goods at a profit of at least 30 per cent over the gross cost. Therefore, if this dealer is to be protected, such a figure should properly be placed upon the goods by the central station.

This does not mean that all goods must be sold at an advance of 30 per cent above cost. There are certain articles, such as Christmas-tree outfits and other articles of seasonal sale, for which much higher rates may be obtained, while, on the other side, it is often possible to dispose of large quantities of a given article in a special sale at a price where the 30 per cent margin may be reduced; but the average profit should not be less than 30 per cent on the gross cost.

Electrical Showrooms

Most central-station companies have come to recognize the showroom as a necessary adjunct to their business-getting quarters. The showroom may be an adequately equipped store in a convenient location or the street floor in the company's office building. Electric shops in retail centers where the crowds go have been opened with much success by some of the largest central stations in the country, and at each branch office, where such are maintained by central-station companies, displays of appliances should be made, to interest the prospective customer in the use of electricity. Wherever situated, these appliance sales bureaus, under whatever name, being a part of the revenue-producing work of the central station, should most advantageously be operated as a part, and under the jurisdiction of, a selling organization.

As a type of display room, Fig. 1, showing the Edison Shop of the Edison Electric Illuminating Company of Brooklyn, is of interest. This shop was decorated at Christmas time, featuring a display of electrical Christmas goods, together with tree lighting.

It will be noticed on scrutiny of this picture that there are a desk and cashier's cage at the far end of the room so that when contracts are to be signed or bills paid in this room the customer passes the showcases and the goods for sale twice.

Figs. 2 and 3 show two windows in separate branch offices of the Edison Electric Illuminating Company of Brooklyn, featuring special sales—in one case of percolators and in the other case of lamps.

So satisfactory have been the results from window displays that the Brooklyn Edison Company now employs a trained window dresser to trim its five branch-office show windows, with special-sale advertising, a change of display being made monthly.

FIGS. 4 AND 5—HOW THE BROOKLYN EDISON COMPANY WORKS IN CONJUNCTION WITH ELECTRICAL CONTRACTORS

Special Monthly Sales

An experiment has been tried in Brooklyn within the last year which has resulted most satisfactorily, and that is the featuring of some particular appliance for sale during a given month. In order to give publicity to such sales, billboard and other advertising is used,

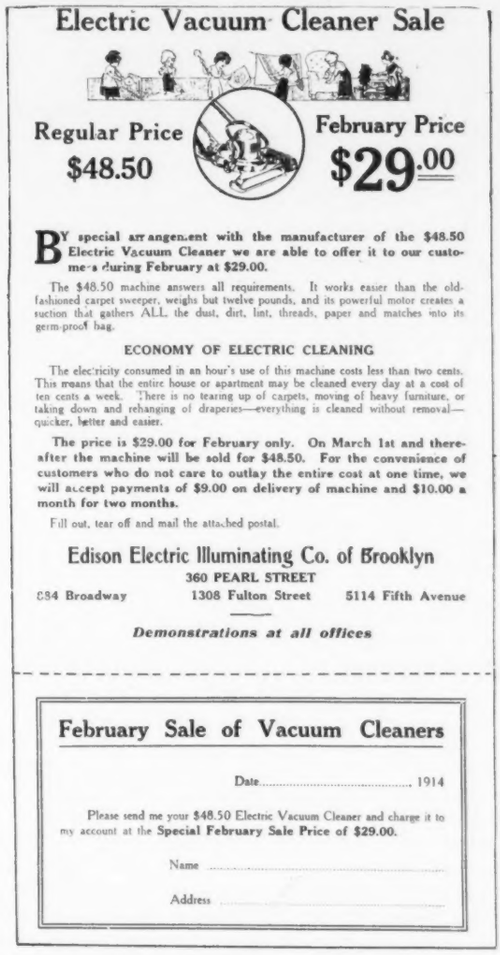

Electric Vacuum Cleaner Sale
Regular Price
$48.50
February Price
$29.00
BY special arrangement with the manufacturer of the $48.50 Electric Vacuum Cleaner we are able to offer it to our customers during February at $29.00.
The $48.50 machine answers all requirements. It works easier than the old-fashioned carpet sweeper, weighs but twelve pounds, and its powerful motor creates a suction that gathers ALL the dust, dirt, lint, threads, paper and matches into its germ-proof bag.
ECONOMY OF ELECTRIC CLEANING
The electricity consumed in an hour's use of this machine costs less than two cents. This means that the entire house or apartment may be cleaned every day at a cost of ten cents a week. There is no tearing up of carpets, moving of heavy furniture, or taking down and rehanging of draperies—everything is cleaned without removal—quicker, better and easier.
The price is $29.00 for February only. On March 1st and thereafter the machine will be sold for $48.50. For the convenience of customers who do not care to outlay the entire cost at one time, we will accept payments of $9.00 on delivery of machine and $10.00 a month for two months.
Fill out, tear off and mail the attached postal.
Edison Electric Illuminating Co. of Brooklyn
360 PEARL STREET
684 Broadway 1308 Fulton Street 5114 Fifth Avenue
Demonstrations at all offices
February Sale of Vacuum Cleaners
Date..... 1914
Please send me your $48.50 Electric Vacuum Cleaner and charge it to my account at the Special February Sale Price of $29.00.
Name .....
Address .....

FIG. 6—OVER 500 VACUUM CLEANERS WERE SOLD ON THIS MONTHLY SALE

and a post card, such as shown in Fig. 6, is included with each bill sent to the company's customers. As a result of such advertising methods during the month of February, 1914, over 500 vacuum cleaners were sold, and during another month 2000 electric irons.

This method of stimulating appliance sales along standard merchandising lines should have careful consideration from the wide-awake central-station manager.

Contractors' Window Plan

In conjunction with the window displays in the company branch offices, the Brooklyn Edison Company also encourages the display of appliances in contractors' windows and even goes so far as to light contractors' windows in good locations without charge, in return for the placing of a sign in the contractors' windows reading "Edison light and power. Applications received here."

Not only are appliance sales stimulated in this manner, but contracts are received and signed with the co-operation of the contractor, who, in addition, gets the wiring contracts and a profit on the appliances which he sells.

Two such windows, one showing Hebrew wording, are featured in Figs. 4 and 5.

Issuing of Appliances on Trial

In connection with the window displays above noted, it is the practice of many companies to send to each new customer an electric iron for thirty or sixty days' trial. With the iron is usually sent a polite note calling attention to its merits, and this is followed by a call from a demonstrator, who explains the use of the iron to the customer. Figures compiled as a result of this method of placing irons show that approximately 70 per cent of such irons are sold, and at 10 cents per kw-hr. they produce a monthly revenue on each iron of not less than 60 cents.

In the sale of all these appliances, the matter of proper delivery, preferably by electric shop wagons, should be considered; stock records should be kept carefully, and strict clerical routine installed along modern merchandising lines.

This article is not meant to deal with the method of accounting in connection with the goods sold, but rather to present a few facts in connection with the methods of display, selling prices and the results obtained.

Two reports from central stations for the year 1914 show, in one case, over $100,000, and in the other over $60,000, worth of appliances sold, at a profit commensurate with the figures noted in this article.

ELECTRIC FANS IN THE WINTER

How They May Be Installed in the Cold-Air Intakes of Furnaces to Increase Temperature and Reduce Coal Consumption

By PERCY W. GUMAER

At this time of the year the electric fans which were considered so necessary to our comfort five months ago

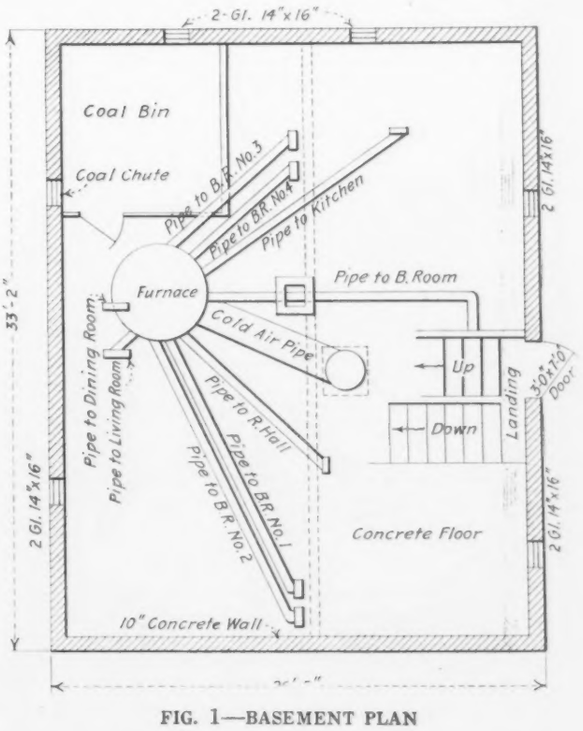


FIG. 1—BASEMENT PLAN

have been retired to their winter of idleness. Although each electric fan represents an investment of from $10 to $20, it is used for only a small part of the year, and few persons have considered the possible uses to which an electric fan can be put during the winter.

A steam or hot-water radiator usually has only suffi-

cient heating surface for the average minimum outdoor temperature, and hence the radiator is too small to raise the temperature of the room to the desired value on an exceptionally cold day. If, instead of calling the janitor names or helplessly shivering, the electric fan were brought into operation the temperature of the room could easily be increased to a comfortable degree within a short time. Placing a fan on the floor so as to blow cool air against the radiator increases greatly the heat convection from the radiator. The effective heating surface of the radiator can thus be increased at a time when it is most needed. In offices, apartments and private dwellings this application of electric fans will be found very convenient and useful.

An electric fan is also very serviceable in connection with a hot-air furnace. Placed in the cold-air intake the electric fan will not only cause the rooms to heat more quickly but it will actually increase the efficiency of the furnace. The ventilation of the house will be improved by the increased circulation of the air, and the coal bill will be decreased.

A series of tests conducted last winter by two senior engineering students of the University of Missouri showed definitely the saving in coal to be obtained by the use of an electric fan in the cold-air duct of a hot-air furnace. While the exact figures obtained apply only to the house in which the tests were made, the construction of the house and its arrangement are so near to that of the average American home that the results of the tests are thought to be of general interest.

The tests were conducted in an eight-room frame house, the plans of which are shown in Figs. 1, 2 and 3. The electric fan was placed in the cold-air duct and held in place as shown in Fig. 4. The method used in the tests was to determine the amount of coal necessary to be fired to maintain an average house

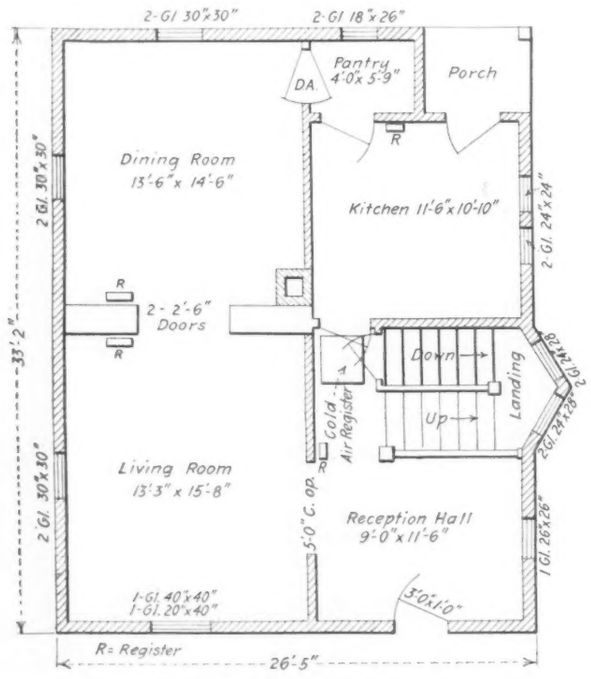


FIG. 2—FIRST-FLOOR PLAN

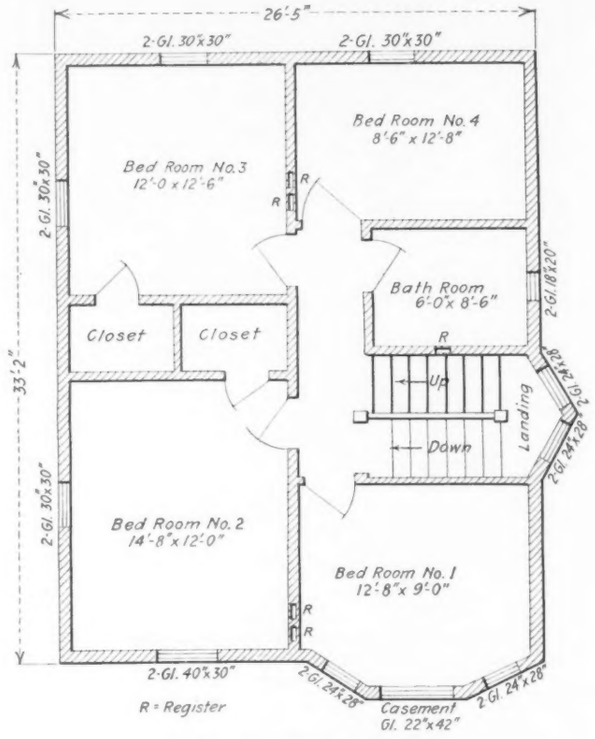


FIG. 3—SECOND-FLOOR PLAN

13,500 heat units per lb. The coal was broken up into lumps the size of a hen egg, picked over by hand, and only the pieces of a uniform size were used. The coal used each time was carefully weighed on a pair of platform scales. Readings were taken of the amount of coal "fired," temperature of each room, outdoor temperature, temperature of the air in the cold-air duct, velocity of the air in the cold-air duct, temperature of the air leaving the hot-air registers, watts input of the fan, and the line voltage.

Each test was begun with the average house

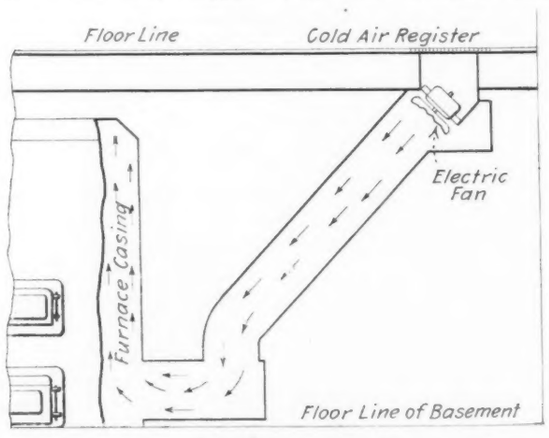


FIG. 4—POSITION OF FAN

temperature of 71 deg. Fahr. for various outdoor temperatures. The difference between the coal fired with the electric fan and without it for a given outdoor temperature represented the saving of fuel due to the use of the electric fan.

The interval between stokings was chosen arbitrarily as fifteen minutes. The method of firing, the rate of stoking and the setting of the dampers were the same for all the tests. The coal used in the tests was Illinois lump with an average heating value of

temperature in the neighborhood of 71 deg. Fahr. Readings were taken every fifteen minutes until the average house temperature had remained constant for at least an hour. If this average temperature was above 71 deg. Fahr., the amount of coal fired every fifteen minutes was reduced, and if below 71 deg.

the amount of coal fired was increased. Thus the proper amount of coal required to maintain the average house temperature at 71 deg. was determined for various outdoor temperatures with and without the fan running.

Table I shows the readings taken for an outdoor temperature of 15 deg. with the fan running and with the fan at rest. The room temperatures were determined by means of mercury thermometers hung in the center of each room 5 ft. above the floor. It will be noticed from the data that, although the outdoor temperature had increased 1 deg. in the second part of the test, the furnace required 8 ounces more coal every fifteen minutes to maintain an average room temperature of 71.3 deg.

TABLE I—TEST WITH EXTERNAL TEMPERATURE OF 15 DEG. FAHR.

	Room Temperatures, Deg. Fahr.					Outdoor Temperatures	Temperatures in Cold-Air Duct	Time of Day	Average Room Temperatures	Weight Coal Fired Every 15 Minutes
	Dining-room	Living-room	Bedroom No. 1	Bedroom No. 2	Bedroom No. 3					
Blower running	68.0	67.5	65.0	67.0	69.5	13.0	62.5	9.00	67.4	4 lb.
	69.5	68.5	67.5	68.0	70.0	13.5	63.0	9.15	68.4	4 lb.
	70.5	69.5	68.0	69.3	71.5	14.0	63.0	9.30	68.6	4 lb.
	71.2	70.3	69.0	70.6	72.0	14.0	64.0	9.45	69.7	4 lb.
	72.0	71.3	68.5	70.3	72.5	15.0	64.5	10.00	70.6	4 lb.
	72.2	72.0	70.0	70.0	71.5	15.0	65.7	10.15	71.16	4 lb.
	72.3	72.5	70.0	70.2	72.0	15.0	66.0	10.30	71.14	4 lb.
	72.2	72.0	70.0	70.4	72.2	15.0	67.0	10.45	71.3	4 lb.
	72.0	72.0	70.0	70.4	72.5	15.0	67.5	11.00	71.3	4 lb.
Blower turned off	71.5	71.5	69.0	70.0	72.0	15.0	65.5	11.15	70.80	4 lb. 8 oz.
	71.5	71.5	69.0	70.0	71.8	15.0	66.0	11.30	70.70	4 lb. 8 oz.
	71.8	71.7	69.5	72.2	69.5	16.0	65.8	11.45	70.90	4 lb. 8 oz.
	72.2	72.2	70.0	70.0	71.6	15.5	65.8	12.00	71.20	4 lb. 8 oz.
	72.4	72.0	70.0	70.0	71.4	16.0	65.5	12.15	71.50	4 lb. 8 oz.
	72.4	71.8	70.0	70.0	72.0	16.0	65.8	12.30	71.2	4 lb. 8 oz.
	72.0	71.8	70.0	70.0	72.0	16.0	65.5	12.45	71.16	4 lb. 8 oz.
	72.1	71.8	70.0	70.5	72.0	16.0	65.5	1.00	71.20	4 lb. 8 oz.
	72.5	72.0	70.0	70.0	70.0	16.0	65.5	1.15	71.30	4 lb. 8 oz.

The tests were repeated for outdoor temperatures of 4, 25 and 35 deg. Fahr. with the results shown in Table II.

TABLE II—RESULTS OF TESTS AT VARIOUS TEMPERATURES

Outdoor Temperature, Deg. Fahr.	Pound Coal Fired Every 15 Minutes		Pounds of Coal Saved in a Day of 16 Hours by Using the Fan
	With Fan	Without Fan	
4	6.0	6.5	32
15	4.0	4.5	32
25	2.5	3.0	32
35	2.0	2.25	16

With coal at $4 per ton the amount saved per day in the cost of coal was 6.4 cents. With electricity at $0.06 per kw-hr. the cost per day of running the fan, which consumed 47 watts, was 4.6 cents. The net saving obtained by using an electric fan in the cold-air duct of a furnace was, therefore, 1.8 cents per day at the above prices for coal and electricity.

While the saving obtained alone would not perhaps warrant a person in buying a new fan especially for use in connection with his furnace, the use of last summer's electric fan will be found advantageous. Besides the saving in fuel resulting from the use of the fan, the ventilation of the rooms is improved, and it is possible to raise the temperature of a cold room in one-fourth the time required without the fan. The rapidity with which the house can be heated on cold mornings when one has overslept will more than repay for the trouble of installing a fan in the cold-air duct.

Table III shows the air velocity obtained in the cold-air duct and the temperature of the air leaving the hot registers with and without the fan. It will be noticed that the temperature of the air leaving the registers was lower with the fan than without it. The increased efficiency of the furnace is attributable in part to this lower temperature of the air in the ducts. The increase in the air velocity also increases the efficiency by causing better heat convection inside the furnace.

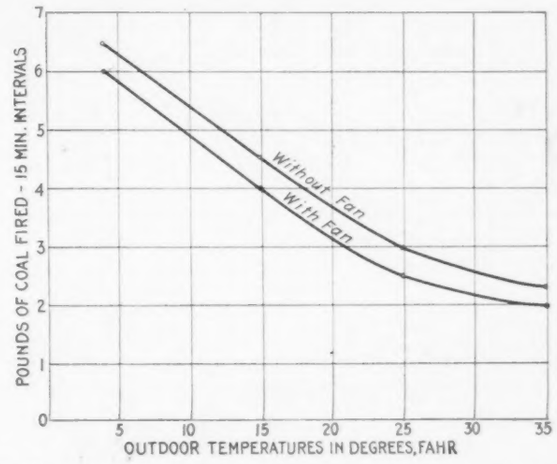


FIG. 5—RELATIVE AMOUNTS OF COAL NEEDED TO KEEP HOUSE TEMPERATURE 71 DEG. FAHR.

TABLE III—TEMPERATURE AND VELOCITY OF AIR AT THE REGISTERS

	Register Temperatures, Deg. Fahr.						Room Temperatures, Deg. Fahr.					
	Dining-room	Living-room	Bedroom No. 1	Bedroom No. 2	Bedroom No. 3	Average Air Velocity at Cold-Air Duct, Feet per Minute	Dining-room	Living-room	Bedroom No. 1	Bedroom No. 2	Bedroom No. 3	Outdoor Temperatures
Blower turned off	172.0	166.0	106.0	114.5	110.0	126.0	68.0	67.8	62.8	67.5	67.3	29.8
	175.5	168.0	107.0	116.0	115.0	.....	69.1	69.0	64.0	68.0	68.0	29.0
	181.5	176.0	110.0	119.0	114.2	121.0	70.4	69.8	64.3	69.0	69.0	30.0
	183.5	176.0	111.0	120.5	115.0	.....	71.5	71.0	65.0	70.0	69.5	29.6
	186.5	178.0	112.0	123.0	116.0	.....	72.3	72.0	66.0	71.0	70.0	30.0
	190.0	181.0	114.0	124.0	118.0	119.0	73.3	73.0	67.0	72.0	71.0	29.0
	191.5	182.0	115.0	126.5	119.0	.....	75.0	74.0	68.0	73.5	72.0	29.3
	192.0	184.0	116.0	127.5	120.0	.....	75.0	74.3	68.7	74.0	73.0	29.5
	192.0	184.0	116.5	128.0	121.0	130.0	76.0	74.3	69.0	75.0	73.0	29.0
Blower running	187.0	179.0	115.0	126.0	119.0	235.0	76.0	74.3	69.0	75.0	73.0	29.0
	182.5	174.0	114.5	125.0	116.0	.....	78.0	76.0	70.0	76.0	74.0	29.0
	182.0	174.0	114.5	124.5	115.0	235.0	78.3	77.0	71.0	76.0	74.3	29.0
	182.0	173.0	114.5	124.5	115.0	.....	79.2	77.3	72.0	76.4	75.0	29.0
	181.0	173.0	114.0	124.5	115.0	226.0	79.5	78.0	72.0	77.0	75.0	29.0
	180.0	172.0	113.5	123.0	113.0	.....	79.5	78.0	72.2	77.0	75.0	29.0
	176.0	169.0	112.5	122.5	112.0	.....	79.5	78.0	72.2	77.0	75.0	29.0
	166.5	169.0	112.5	122.0	112.0	230.0	79.5	78.0	73.0	77.0	75.0	29.0
	166.0	167.0	112.0	121.5	110.0	.....	79.6	78.0	73.0	77.0	75.0	28.0

Display in Railway Waiting-Room

Excellent results are obtained by the Cumberland County Power & Light Company, Portland, Maine, from the display of electrical appliances in the room occupied by persons waiting for the cars operated by the company. A large percentage of the women spend the waiting time examining the electrical appliances, learning of their uses and ascertaining their prices. Many sales result from the curiosity aroused during the waiting period.

Practical Education in Electric Cooking

Model Equipment Installed in the Domestic Science Department of the University of New Mexico

BY H. W. ALEXANDER

STUDENTS of the University of New Mexico's domestic science school are not only learning how to "do it electrically," in so far as cooking is concerned, but they are learning exactly what it costs for electrical energy to brew a cup of coffee, for each piece of bread toasted, for each bit of food prepared.

The Albuquerque Gas, Electric Light & Power Company recently equipped the domestic science department of the university with a complete installation of electrical cooking apparatus. Mr. A. F. Van Deinse, general manager, had charge of the work and saw to it that nothing was overlooked to make it most complete and up to date in every respect, all that could be done for the amount of the appropriation.

FIG. 1—DOMESTIC SCIENCE DEPARTMENT, UNIVERSITY OF NEW MEXICO

Representatives of the company reasoned that if a 5-amp or 10-amp watt-hour meter was attached to the different electrical appliances it would be very easy for each girl to keep an accurate record of the amount of electrical energy required for each article of food cooked. This record could be turned in each day to the instructor, who would mark the pupil accordingly. It was thought that such a method of "keeping tab" on cooking costs would be sure to engender a spirit of competition among the students, who would strive to prepare the best cooked food with the least possible amount of electricity.

It worked. The system was instituted to the complete satisfaction of the university authorities. The watt-hour meter tells just what it costs to prepare a certain dish, and the best record established is set as a mark for the other pupils to attain.

So many housewives have an erroneous idea that cooking with electricity is very expensive that to teach girls in school the contrary is a most valuable aid to the lighting companies, for as these girls leave school they will go out with the idea that cooking electrically, all things considered, is the best and really most economical method. While residing at home they will be most likely to urge their parents to install electrical devices in the kitchen and elsewhere in the house. When the girls become mistresses of their own homes it is only reasonable to suppose they will remember their early training and electrify their homes to the fullest possible extent they can afford. Thus is the educational work passed on to the next generation.

There is another side to this matter which greatly favors the electric companies. When the question of electrical cooking costs comes up in the sewing circle, the club or among housewives the student or graduate is in a position to state authoritatively just what the true costs are, and her words will carry weight every time. People are prone to think that when representatives of the company make similar statements they are biased, whereas they will probably believe without hesitation the statements of one whom they know. And, too, cooking records established at the university, as announced in official publications, will greatly assist the company in its educational work. It all helps.

The illustration shown herewith will give an idea of the equipment of the university's domestic science school. Owing to the floor and ceiling being concrete, it was decided to put the wires in open conduits, with

FIG. 2—ELECTRIC RANGE IN USE

drops for each table. The table itself is novel, embracing as it does Mr. Van Deinse's suggestions for the electrical installation and the cooking instructor's ideas of drawers for flour, sugar, etc.

The Hotpoint oven is featured on the table, though much of the cooking is done on General Electric ranges and Westinghouse and Hughes disk stoves. Coffee is

brewed in percolators of Landers, Frary & Clark make. The next science school appropriation will include a sum with which to purchase washing machines, vacuum cleaners and other useful household equipment—and "Do it electrically" will then become the slogan of the new department.

The Albuquerque Gas, Electric Light & Power Company is controlled by the Federal Light & Traction Company of New York. This holding company also operates two other properties in New Mexico, the Las Vegas Light & Power Company and the Deming Ice & Electric Company. There are domestic science schools established in these cities, the movement having started, as in the case of Albuquerque, with the respective lighting companies. Las Vegas has a population of about 7000, Deming has 3000 people, and Albuquerque's total is 14,000. The latter city is the metropolis of the State.

The Federal company has always been very active in the movement to establish "electrical" domestic science schools and in electrifying schools which had other methods of doing household work. This is the particular hobby of the publicity-sales department. Out of the eleven cities in which the Federal company operates central stations, six have had domestic science schools established within the past two years. The educational value to the lighting companies is inestimable.

The Federal companies are all members of the Society for Electrical Development, Inc., which has rendered to its constituent Federal companies valuable cooperation in the general "Do it electrically" educational movement.

Central-Station Maintaining Appliance-Repair Department

Realizing that an appliance load cannot be maintained at its maximum value if the devices which have been sold are allowed to become inoperative, the Washington Water Power Company, Spokane, is conducting a repair department where consumers' appliances can be fixed up much cheaper than they could be by the average contractor. During 1913 the department repaired 6477 cords and 2777 flatirons at a total cost to the company of $453.24, or 4.9 cents per job, for which no charge was made the consumers. In the same period non-guaranteed devices and complex apparatus were repaired at an average expense to the consumer of $1.33 per job. Even on these jobs, however, the labor expense was only 13 cents per job. Not only was this department self-supporting, but many devices which might have been left on the shelf unused were again made revenue producers. Another advantage of this practice is that consumers are convinced that they will be well repaid for investments in electrical apparatus, as their devices will not be allowed to become useless.

An Electric Iron Given Free with Every Gas-Stove Purchase

Following his return from the South American countries, Mr. E. N. Hurley, of Chicago, has related many interesting stories of the customs and practices of business men in the Southern Hemisphere. Referring to a recent new-business campaign conducted by the public-utilities company in Rio de Janeiro, Mr. Hurley explained that the light, motor-service, street-railway and gas companies are probably the most active, successful and influential businesses in Rio. They are managed by Americans, Mr. F. A. Huntress, formerly of Boston, being the vice-president, and Mr. Carl Sylvester, of Boston, the general manager of the properties in Rio. The capital behind these enterprises is largely Canadian. Dr. F. S. Pearson, of New York, is in control, and the Mackenzie and Mann interests of Toronto are also largely concerned. Their sympathies are British rather than American, as is natural, although most of their equipment has been purchased from American firms.

All modern electrical appliances are used and special selling campaigns are conducted similar to those of American central stations. Goods are sold on monthly payments and an endeavor is made to educate the people to the advantages of labor-saving appliances. The campaign in progress during Mr. Hurley's visit was rather novel. The company was giving an electric flatiron free with each gas stove purchased during a given period, and those responsible for the management of the company declared that the campaign had been a great success.

Striking Flatiron Campaign at Boston

In three recent campaigns of four weeks' duration each the Edison Electric Illuminating Company of Boston, Mass., has added nearly 3000 electric flatirons to its connected load. The latest campaign, which resulted in the sale of 1200 irons of Simplex, General Electric, Westinghouse and Landers, Frary & Clark make, was the most successful and was noteworthy on account of the making by the company of a price of $3.50 per iron on condition that the purchaser should bring to the company's offices one flatiron in each case, for which an allowance of $1 was made toward the price of the new equipment. For $3.50 net a new 6-lb. iron of the purchaser's choice was offered, and the ages, colors and previous conditions of servitude illustrated by the second-hand, third-hand and fourth-hand specimens returned are indicated by the accompanying photograph, which shows some 3 tons of the discarded units mobilized en route to the junk dealer. A reduction of $1 below $4.50 was credited in every case, whether the iron was one of the deadly charcoal burners of the "siege-gun" type or a new 23-cent sadiron, scores of the latter being purchased at a neighboring department store and turned in by exultant patrons who thus saw an opportunity to "strike a bargain" with the company. A few electric irons returned for the sake of new ones were sent by the company to the factory and will soon be on the firing line again. The last campaign was waged along the lines of selective newspaper and window display advertising, with little extra solicitation, and a similar sale is now under way with respect to electric percolators, one being sold for "$5 plus any old coffee pot" during October.

MOBILIZATION OF DISCARDED FLATIRONS

FEBRUARY WINDOW DISPLAYS

Lincoln's Birthday, Washington's Birthday and Saint Valentine's Day Offer Opportunities for Appropriate Settings

BY A. J. EDGELL

January has been the occasion for sales of all kinds. On every side show windows have been filled with sales goods and cards calling attention to "mark-down sales," "pre-inventory sales," "white sales," "clearance sales" or other sales. As a result the coming of February with three days that may be featured offers a welcome relief from the over-abundance of marked-down sales windows.

Some dealers feel that they are wasting effort in trying to get additional business in February. It is certain that the lion's share of whatever business there is will go to the man who makes the best effort to attract it. The merchant who stirs himself into action and makes an effort is apt to be surprised at the results he can obtain, even in February.

The best effort can be made through the show window, for several reasons. It requires little additional expenditure to make it a result getter. The window display when properly made operates at high efficiency. The customer is near the place where the goods are sold, the goods are there ready for sale, and the salesman is just inside, ready to serve. These three conditions exist whenever a customer looks at a well-arranged show-window display.

To secure the attention of the passer-by some feature is frequently necessary. Features such as those enumerated below give a "different" appearance that secures this attention.

Three occasions for unusual displays may be used. The anniversary of Abraham Lincoln's birthday (Feb. 12) is observed to some extent and an effective display can be built around this idea. The sketch shows a background arrangement for use at this time. A large shield cut from blue cardboard or composition board has a large Lincoln profile mounted on it. A band of red, white and blue ribbon runs between two rosettes of the same material. The Lincoln profile can be cut from a picture obtained from a stationery store. The remainder of the decorative unit consists of a card with the date of Lincoln's birth (Feb. 12, 1809) bordered with red, white and blue ribbon and with a rosette on the upper corner. From each rosette strings of silver or gold tinsel are hung.

Saint Valentine's Day (Feb. 14) depends for its observance on sentiment. While this sentiment has no direct connection with business, the use of features symbolic of the day will attract favorable attention, and the attention thus secured can be turned to the merchandise shown by using show cards that will link up the goods with the decorative feature. The background arrangement shown in the sketch can be used with a display of any of the household appliances.

The large letter addressed "To My Valentine" can be obtained from a sign maker or show-card writer. A large heart cut from bright red cardboard has a red crêpe-paper bow attached to it, and from the heart to a corner of the letter loops of red "baby-ribbon," with small hearts, are hung. Other small hearts are hung from the large envelope in the manner shown. The small hearts may be purchased in stationery stores. For a Saint Valentine's display red should be the predominating color.

FIG. 1—SUGGESTED WINDOW BACKGROUNDS FOR LINCOLN'S BIRTHDAY, SAINT VALENTINE'S DAY AND WASHINGTON'S BIRTHDAY

Washington's Birthday (Feb. 22) is generally observed, and for this and Lincoln's Birthday patriotic displays with red, white and blue predominating are suitable. Because of the story of George Washington, his little hatchet and the cherry tree, hatchets and cherries are symbolic of the day. How these may be used in a background arrangement is shown in the sketch.

A large profile of Washington, obtained from a stationery store, is mounted on a circle of cardboard, and artificial cherries and leaves are arranged around the circle, which is fastened to the background. On either side of the background is a hatchet cut from cardboard or composition board. This hatchet has a large bow of red ribbons or red, white and blue ribbon bow tied to it. Artificial cherries and leaves are grouped around the hatchets.

FIG. 2—BOSTON EDISON COMPANY'S WINDOW SETTING FOR WASHINGTON'S BIRTHDAY

A much simpler arrangement as used last year by the Boston Edison company is shown in Fig. 2. In this instance, as will be seen from the illustration, an effective setting was obtained by simply employing a large lithograph of Washington over which two American flags were crossed. The effect might be heightened by employing an electric fan to cause the flags to flutter in the breeze.

Merchandising Methods

The Electrical Dealer of the Future

"The time will soon be here when the retail electrical business will be handled by an electrical dealer operating on some principal retail street of the city a neat, well-appointed store where he will make suitable displays and demonstrations of the lines of electrical devices which appeal to the shopping trade," said Mr. J. L. White, local manager for the Oregon Power Company at Albany, Ore., in an address before the Oregon Electrical Contractors' Association recently.

"This dealer of the future will do practically no contracting but will confine himself strictly to retailing," continued Mr. White. "The installation end of the business he will leave to the general contractor, who will conduct his business from an office building. These conditions will, of course, only occur in cities of the larger size. In many smaller places where the contractor is compelled to carry on a merchandising business we to-day find very complete lines of stock, and such stores compare favorably with the best stores in other lines in our cities."

Magnet Signs Save Window-Placard Expense

Expert window trimmers say that no show window is complete without a placard. But in windows in which the displays are changed often the expense for painting window placards is generally a considerable item in the advertising account. In fact, some electric companies pay from $3 to $7 a week for the painting of cards with catchy phrases which they claim supply a finishing touch to their displays. To reduce such expense several central-station companies in Ohio, among which is the Ohio Light & Power Company at Tiffin, have purchased changeable magnet signs. The letters used with these signs consist of metal patterns faced with heavy baked white enamel. To the back of each letter is attached a small permanent bar magnet, about 0.75 in. long. The backgrounds for these letters are made of iron of such thickness that it can be handled easily and can, to enhance its appearance, be placed in picture frames of narrow design.

When a placard for a window is wanted it can be made at a moment's notice with this outfit by placing the letters in any desired position against the black iron background, the small bar magnet holding the letters in place. With this system the placard wording can be changed as often as is desired without additional expense. The outfits are made by the National Magnetic Sign Company, of Cleveland, Ohio, and are sold in neat black cases, which afford a convenient place for storing the extra letters and iron backgrounds not in use.

A Vacuum Cleaner for Every Shoe Store

Retail dealers in ladies' fine shoes suffer a loss each year because good shoes that are scratched in the process of "trying on" must be sold at reduced prices. A woman will not pay a high price for a pair of shoes that are scuffed; hence the retail dealers try to keep their heavy carpets and rugs free from sand and grit. Many a merchant thinks he does his best to have the store clean when the "boy" sweeps and dusts the store every day. However, when a shrewd shoe dealer in Alliance, Ohio, saw the amount of grit and sand which his wife's electric cleaner brought out of his supposedly clean rugs she lost her vacuum cleaner. It was through the merchant's wife that the story leaked out, for when she came to the office of the Alliance Gas & Power Company to buy a second cleaner the salesman was naturally curious to know what had happened to the first one he had sold her. When later he called on her husband he heard a remarkable account of savings in damaged shoes. This good news filled him with so much enthusiasm that he sold a vacuum cleaner to practically every other responsible shoe dealer in the city. The merchants are well pleased with their cleaners and are thanking the electric company's new-business man for the saving he has made for them.

Abuses of Cash Discounts

Customers who seek to secure cash-discount allowances on their accounts after the expiration of the cash-discount period agreed to in the original conditions of sale were severely arraigned by several speakers at the recent meeting of the Electrical Credit Association of Chicago.

Mr. John M. Kirby, Consumers' Rubber Company, Cleveland, Ohio, defined the cash discount as a certain premium given to the customer in order that cash may be kept working. In the beginning, he explained, it was probably conceived that time would be required for the transmission of mail, the making of invoices by the customer's clerical force, etc., and hence a grant of first five and then ten days was allowed the customer.

The Growth of the Evil

From time to time various business exigencies suggested the addition of five days to the original period, until finally it became the fashion to extend the discount date to the first of the following month, all pending accounts being meanwhile stopped after the twenty-fifth of the first month for extension on to the bill of the second following month. Later the discount date was changed to the fifth and finally to the tenth of the month, until now, said Mr. Kirby, the terms "tenth proximo" are probably the most popular in ordinary business use. Some firms even put the burden of the transportation period on the seller and require that the goods be placed on the customer's platform before the discount period begins. There is a remedy for this evil, said Mr. Kirby, but it will require courage to put it in effect. The cure he proposed was publicity among credit men, and he also suggested that credit men agree on the extremes of necessity and determine some fair allowance for discount dates.

Mr. A. O. Kuehmsted, Gregory Electric Company, Chicago, said that an effective solution of the evil will be found in the practice of returning to the senders with a polite note all checks which do not bear the full amount after the lapse of the discount period.

Remedies Proposed

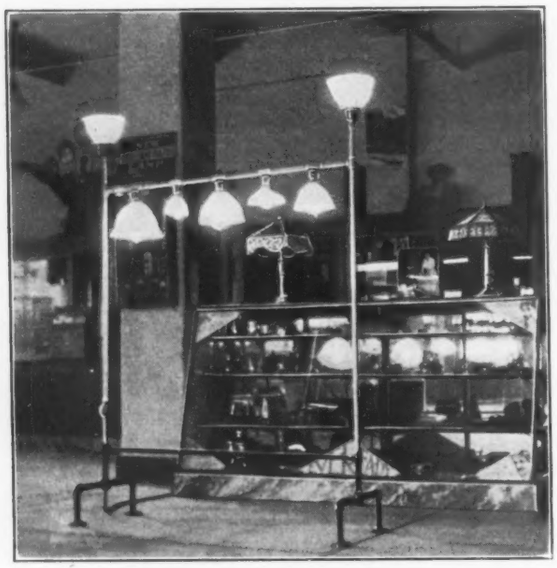
Mr. Benjamin George, Beardslee Chandelier Manufacturing Company, Chicago, said that checks should be returned for the principle of the thing regardless of the amount. He recited an incident where a customer had commented on one company passing over a defaulted discount of 3 cents on a bill of $1.50, although a discount of $2 on a larger bill was protested. Some credit men would not think of returning checks, said Mr. George, for they declare that the cash in hand is worth too much to risk offending a customer.

Mr. F. W. Seywert, Erner Electric Company, Cleveland, Ohio, said that the custom of cash discounts has become a great business evil and one which causes much embarrassment. At the present time many customers consider it sharp practice to take advantage of the cash discount after the lapse of the discount period. The

seller, however, should insist on a proper observance of the terms of the contract and should explain to his customers that a new era of business ethics has arrived. Such a policy of education, declared Mr. Seywert, will go far toward correcting the abuses described.

Handy Lamp and Shade Demonstrator

Of the many types of lamp and shade demonstrators to be found in appliance stores and central-station salesrooms, the design shown herewith is perhaps most simple in construction. It is also effective, being sufficiently individual to command the attention of the customer. The entire frame is built of conduit and conduit fittings.



LAMP AND SHADE DEMONSTRATOR

Resting on four pipe-flange feet, the demonstrator may be moved about the salesroom of the B-R Electric Company, St. Louis, where it is used, to any point where an electric outlet makes electricity available. This design of demonstrator is particularly well adapted for exhibiting glassware in both pendent and inverted positions.

Double Co-operative Campaign Proves Big Success

Between Dec. 4 and Dec. 14 the Toledo (Ohio) Railways & Light Company, in co-operation with the Toledo office of the Westinghouse Electric & Manufacturing Company, conducted an extensively advertised and vigorous electric-appliance campaign. Between Dec. 14 and Dec. 24 another equally vigorous and equally well-advertised campaign was conducted in co-operation with the local office of the General Electric Company. The idea of following one large general appliance campaign immediately with another was a new one, but the results obtained by this "double-header" Christmas sale were startling. In the first ten-day interval 1500 appliance sales were made, and in the ten days just before Christmas 2100 sales were made.

In these campaigns the salesmen were instructed to call upon non-users as well as users of electric service, and in this way many appliances were sold to people in unwired homes who wished to give electrical presents to their more fortunate friends. The slogan of the solicitors was, "Don't be a piker! Sell from two to a dozen electrical gifts to each prospective customer."

In totaling up the sales it was found that the most useful appliances, such as irons, toasters and percolators, were the best sellers, although almost every type of electrical appliance from bell-ringing transformers to chafing dishes was in demand. When it is considered that the Toledo company has now 24,000 electric-service customers, of whom 18,000 are residence customers, and that 2500 appliances were sold to these same customers in the month of July, 1914, the results obtained from this double sale are still more surprising. The Toledo men believe that there must be no point of saturation. In conducting the sales Mr. A. K. Young, new-business manager of the central-station company, was aided by Mr. H. W. Brooks, of the Westinghouse Electric & Manufacturing Company, and Mr. A. W. Little, of the General Electric Company.

An Envelopeless Order Blank

A St. Paul (Minn.) jobbing house furnishes its customers with mail-order blanks which can be folded up, sealed and mailed in to the home office without an envelope. The form, which is patented, has on one side the usual order blank with spaces for the customer's name, address, routing of shipment and items wanted. On the other side the jobber's name and address are handily printed. A side flap is already gummed, so that all the intending customer has to do is to write his order, fold up the sheet and seal it, affix a two-cent stamp and drop the blank in the mail box.

The Fine Art of Being a Salesman

The qualifications of character and ability necessary to successful work as a salesman of electrical apparatus or electric service were discussed by Mr. Charles A. Munroe, vice-president of the Public Service Company of Northern Illinois, Chicago, in an address before the Chicago Jovian League on Dec. 28.

First among the requirements for successful selling is enthusiasm for the work, said Mr. Munroe. It is the love of his job which enables the salesman to withstand the rebuffs and discouragements which come in the course of the day's effort. Without such enthusiasm, he is almost sure to be a failure. But the degree of the salesman's success depends, in the ultimate, upon his equipment of brains and will power. The high-grade salesman is an educated man, able to talk intelligently to many men on many subjects. The broader his interests, knowledge and sympathies, the more opportunities will he find to increase his own usefulness and selling ability.

The Faculty of Unconscious Instruction

The successful salesman need not be a fluent talker. Many able commercial representatives are men of few words, yet each word spoken counts with effect upon the person addressed. Most of these men also have the valuable quality of imparting their ideas to others while leaving the impression that these convictions were original in the minds of the auditors. In the words of Franklin, as quoted by Mr. Munroe:

> "We should teach them as if we taught them not;
> Things unknown should be proposed as if things forgot."

The close relation between the personal life of a man and his work during office hours is now being appreciated by the business world in making its estimates of a salesman's qualifications. Unless a man is scrupulously honest he should have no part in the profession of the salesman. The field work of the commercial representative, a large part of which must be without supervision, is a test indeed for a man's moral fiber. He

must take care to see that no "padding" creeps into his expense account, that his reports are accurate and correct, and that he filches for personal ends no part of the time which rightfully belongs to his employer. No sooner will the line between right and wrong become blurred than his usefulness as a salesman will begin to wane.

Enthusiasm Essential Above All Else

All the foregoing qualities of ability, brains, will power and character the salesman must have; "but enthusiasm," concluded Mr. Munroe, "is the heat which fuses these elements together and effects success."

The salesman must love his work, and when he talks he must talk as if he meant it, for he does mean it.

The complex field of modern business offers no greater opportunities than those open to the salesman. If the demands upon the high-quality salesman are severe, certainly the rewards given to the successful salesman are commensurate with those demands.

Central-Station Sales Agents

T. I. Jones

Few men in the central-station commercial field are better known than Mr. T. I. Jones, general sales agent of the Edison Electric Illuminating Company of Brooklyn and former chairman of the Commercial Section of the National Electric Light Association. Mr. Jones was educated in electrical engineering at the Massachusetts

T. I. JONES

Institute of Technology and is a lecturer on electrical subjects for the New York Board of Education.

Mr. Jones' experience in the electrical industry has been wide and varied. After being identified with the telephone industry for six years he joined the Nernst Lamp Company as illuminating engineer and while thus engaged was called upon to organize the sales department of the United Electric Light & Power Company of New York City, becoming its first sales manager. After two years' work with the United company he was invited to direct the sales activities of the Brooklyn Edison company.

He is a stanch believer in merchandising electrical appliances at a profit and in working in harmony with local electrical contractors. Since Mr. Jones headed the sales force of the Brooklyn Edison company five years ago, its gross business has increased from less than $4,000,000 to $6,240,000.

Jobber Offers Dealers Prizes for Best Fan Display

To prompt dealers to prepare attractive fan displays when the warm weather arrives the Western Electric Company has issued a folder entitled "Selling Fans" in which it offers six prizes amounting to $100 for the most attractive window displays featuring electric fans. The first prize is $50 and the successive ones are respectively $25, $10, $5, $5 and $5. The company will furnish on request the background shown in the accompanying cut. Rules governing the contest follow: The foreground of the window display must be originated and dressed by a member of the firm taking part in the contest or by an employee; the window must contain as a basis a fan display, the fans to be supplied by the dealer; no electrical dealer shall receive any help from the Western Electric Company's representatives in planning the display; the display is to remain in the show windows not less than one week; every contestant must send at his own expense a photograph at least 5 in. by 7 in. to the company which will also have the right to the negative; photographs must be in the hands of the Western Electric Company by Sept. 1, 1915, at or about which time the prizes will be awarded; displays

Here Is Your Opportunity

to win one of these prizes, and, at the same time, obtain the best fan window display outfit ever offered.

It will bring business into your store.

PRIZES

$50.00 First Prize
$25.00 Second Prize
$10.00 Third Prize
$5.00 Fourth Prize
$5.00 Fifth Prize
$5.00 Sixth Prize

A COOL WAVE IS HERE

Window Display Outfit W-43

WE furnish the background and the large wave cut-out, shown above. The fan is to be taken from your own stock. With this material you construct your window display. Many beautiful and attractive effects may be obtained; sand may be used on the window floor to continue the beach; kewpie dolls, miniature tents, boats, flags, etc., may be used to advantage. Colored lights can be used so as to give good results for a night display.

A miniature boardwalk equipped with small electric lights for a night display would attract attention. These are only suggestions. You are to use your own ingenuity and originality in fixing up the display.

The Following Rules Will Govern the Contest:

1. The foreground of the window display must be originated and dressed by a member of the firm or by an employee.

2. The window must contain as its basis a fan display, the fan or fans entering into the display to be taken from stock. (The size of the display is not the deciding factor).

3. Window displays are to be judged by their probable ability to attract genuine interest to electric fans. Freak displays will not be entitled to consideration unless they have a strong value outside of their freakishness—a strong interest-creating value.

4. No electrical dealer shall receive any help whatever from the Western Electric Company's representative in the planning or execution of the display.

5. The display is to remain in the show window not less than one week.

6. Every contestant must procure a photograph (at least 5"x7") of his window at his own expense, and mail a print to us, this print to remain the property of the Western Electric Company, whether or not the window is a winner. The negative is to be sent to us if we ask for it. The photograph must show the display as it is for the entire week.

7. Photographs must be in our hands by September 1, 1915. Awards will be made as soon thereafter as practicable, and photographs of the winning window displays will be reproduced in the Western Electric News.

The contest will be conducted by the Western Electric News. Photographs should be mailed to Contest Editor—Western Electric News, 463 West Street, New York City. The committee of award will consist of a representative of the

Electrical World *Electrical Review* *Electrical Record*
National Electrical Contractor *Society for Electrical Development*

Order Your Background and Wave Cut-Out Today.
Check Number 43 on the Enclosed Card and Mail Today.

ANNOUNCEMENT OF FAN DISPLAY CONTEST

will be judged by their probable ability to attract genuine interest to electric fans; freak displays will not be entitled to consideration unless they have a strong interest-creating value outside their freakishness. The company also offers attractive newspaper advertising electrotypes, window-display and street-car cards, mailing folders and attractive motion-picture theater lantern slides.

Electric Vehicles

ELECTRIC STREET SPRINKLERS

Motor Vehicles Will Replace All Horse-Drawn Equipment for Municipal Department Work in Calgary, Canada

Two of the eight electric trucks used for nearly a year by the several municipal departments of Calgary, Canada, have effected a daily saving of $24 in the cost of sprinkling and flushing streets. Cost records for at a saving of about $24 per day of seventeen hours over horse-drawn machinery. During winter months the tanks are removed and replaced by boxes which will hold 6 cu. yd. of refuse.

Calgary has 1,300,000 sq. yd. of pavement, covering 54 miles of paved streets. The full equipment for keeping this clean consists of four horse flushers, four rotary brooms, two squeegees, five horse sprinkling tanks and two 5-ton electric motor trucks. In a test the two trucks used by the street-cleaning department averaged 38 miles each per day of nine hours sprinkling

OPERATING COSTS AND BOXED CHARGES FOR EIGHT ELECTRIC TRUCKS IN CALGARY, CANADA

	Vehicle Number								Monthly Average per Vehicle	
	1	2	3	4	5	6	7	8	For March	To Date
Capacity, tons	1	1	3	3	5	5	5	1	.....	.....
Supplies	$0.50	$0.50	$0.65	$0.65	$0.75	$0.75	$0.75	$0.50	$0.63	$0.63
Repairs	23.71	36.39	13.37	168.90	370.29	387.36	11.98	.....	120.56	28.90
Energy	11.68	11.97	16.78	14.63	51.01	19.82	12.34	1.87	17.89	14.45
Garage	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Garage employees	28.75	28.75	37.75	37.75	42.75	42.75	42.75	28.75	36.25	42.01
Drivers' wages	80.00	75.60	99.15	72.45	80.00	80.00	80.00	20.70	73.49	79.24
Total maintenance	107.22	163.11	177.70	391.38	557.80	540.68	157.82	61.82	258.82	175.23
Interest, sinking fund, depreciation	50.83	50.83	68.23	68.33	84.16	92.91	92.91	50.83	69.88	71.01
Storage-battery department	14.58	14.58	23.61	23.61	27.78	27.78	27.78	14.58	21.79	22.21
Total charges, month	172.63	228.52	269.64	396.32	669.74	661.37	278.51	127.23	350.49	268.45
Total charges to date	1933.03	1955.85	2468.76	2417.52	2997.29	3333.54	2564.58	885.59	2282.08	268.45
Average cost per month	214.78	217.32	274.31	268.61	233.03	337.06	284.95	177.12	263.39	268.45
Days in service	26	26	27	24	26	11	26	16	.....	.....
Miles, month	796	649	525	562	696	180	403	140	494	615
Total miles	7176	7061	5083	5375	4581	5855	5208	1475	.....	.....
Months in service	9	9	9	9	9	9	9	5	.....	615

these and the other six machines have indicated such a substantial saving by the use of the electrically propelled vehicles that they will replace all of the horse-drawn equipment as the latter wears out.

There are three 1-ton trucks for the electric-light, stores and street-railway departments, two 3-ton trucks for the water-works and stores departments, one 5-ton truck for the sanitary department, and two 5-ton trucks for the street-cleaning department.

The electric sprinklers and flushers cost $11,440. Each sprinkler does the work of three teams and each flusher the work of two teams.

During the summer months the sprinklers and flushers are operated in day and night shifts of nine hours, sprinkling by day, and eight hours, flushing by night, and 17 miles each per night of eight hours flushing. This work cost $1.30 per truck for energy during the seventeen hours.

Truck Specifications

The specifications of the 5-ton electric sprinkler truck follow: Water capacity of tank, 1200 U. S. gal.; total length of tank, 160 in.; inside diameter, 51 in.; air compartment in forward end of tank, 36 in. long—25 per cent of tank volume; pressure in air tank, 65 lb.; total weight of tank, 3600 lb.; tank provided with air and water pressure gages and safety valve in by-pass connecting water space with air chamber. The tank is filled by means of a 2½-in. water-intake valve in the center of the rear drumhead. The water discharge is controlled through lever gate valves operated by hand

ELECTRICALLY DRIVEN STREET-SPRINKLING WAGONS OF CALGARY

at the driver's seat. The two flusher nozzles may be worked together or independently. The main outlet connection is a 4½-in. standard pipe; the flushing nozzle connections are 2½-in. pipe.

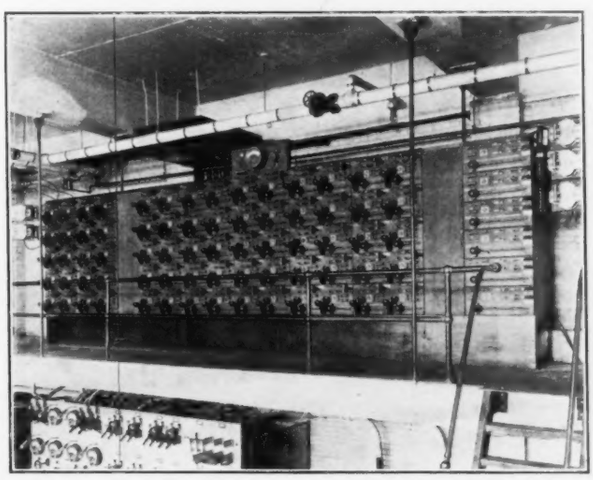
The interest, sinking fund, depreciation and special battery depreciation are not charged direct to the different departments, a special fund being set aside for this purpose. In the report from the electric vehicle department, summarized herewith, vehicle repairs for the month of March, 1914, were $387.36. This included a new set of rear tires for one of the sprinkling trucks, at a cost of $380 the pair.

The trucks were supplied by the General Motors Company.

Large Charging Installation for Cambridge (Mass.) Bakery

One of the largest and most interesting battery-charging stations in New England has recently been completed at the plant of the Ward Bread Company at Cambridge, Mass., which uses about seventy electric vehicles in its transportation service. As shown in the accompanying photograph, the equipment consists of a switchboard composed of thirty-five duplex unit sections and a separate board of six unit sections for charging, discharging and forming lead batteries. Energy for battery service is obtained from three-wire, 115-230 volt generators in the Ward company's plant and the battery-charging rheostats are installed on a gallery in the engine room adjacent to the garage proper.

Each duplex charging unit is self-contained and provided with a double-pole, double-throw knife switch, a fifteen-step slider-type rheostat, reverse-current circuit-breaker, inclosed fuses, and an indicating lamp for each of the two sets of batteries charged from one of these units. The double-throw switches enable the operator to charge the battery from either side of the neutral of the three-wire system, which greatly facilitates close balancing. These switches are provided with special



BATTERY-CHARGING SWITCHBOARD IN BAKERY

clips arranged so that the charging current and voltage across the battery can be read simultaneously and without interrupting the charging circuit. The slider-type rheostats are each designed for charging a battery of forty-two lead cells at 30 amp to 8 amp, the resistances being of the cast-grid type and being carried directly on the back of the duplex units.

The reverse-current circuit-breaker on each unit serves to separately disconnect each battery from the busbars in case the power goes off the system, or should the current through the battery be reversed from any cause. As the circuit-breaker is mechanically interlocked with the rheostat slider, it is impossible for an attendant to begin the charge on the battery without first placing all the resistance in the rheostat in series with the battery. Each of the charging outlets is separately protected by the inclosed fuses. The pilot lights are of 2 cp each and show when a battery has been plugged in for a charge. Four duplex volt-ammeters are included with the board, none of which is connected into circuit, however, except during the operation of taking a reading, as indicated above. Over the center of the charging board a small slate panel has been added which carries a 300-amp, central-zero ammeter, with overload relay. The meter and relay are tapped into the neutral bus and the relay rings an alarm bell in case the out-of-balance current rises above a predetermined value. The system can be rebalanced by the double-throw switches on the duplex units.

The six-circuit charging, discharging and forming panel is similar in general construction to the foregoing equipment. Each section is provided with a thirty-step rheostat, and besides the 30-amp to 8-amp charging control a 30-amp to 15-amp discharging control is provided. A separate volt-ammeter is installed.

The entire equipment can easily be extended, and soon it will probably be necessary to take care of forty additional vehicles. The Cutler-Hammer Manufacturing Company furnished the entire equipment.

Vehicle "Hiker" Service in Business District

Since Dec. 15 Mr. Harry Salvat, who operates a large electric-vehicle garage in an outlying residential district of Chicago, has been furnishing patrons of his establishment with a special call and delivery service while they do their shopping in the downtown department stores. Two men in uniform are stationed at a well-known store in the business district where they await the summons of car owners who wish to have their vehicles taken care of while down town. Calls are sent in by telephone, or the vehicle users stop by the store, pick up the "hiker," and continue to their destinations, the "hiker" driving the car back to the garage or returning it to the owner at an appointed hour and place.

Since this special service has been available the number of car owners taking advantage of it has averaged eighteen a day. The Salvat garage houses 180 electric cars. No charge is made for the service, but the obliging "hiker" is usually rewarded with a "tip" from the car owner. The plan has worked out so well that the local section of the Electric Vehicle Association is considering the establishment of a more comprehensive "hiker" service of similar kind, to be available to all Chicago users of electric vehicles on call from down-town hotels and department stores.

Jovian Electric Double Page at Toledo, Ohio

Co-operative newspaper advertising by electrical interests in Toledo, Ohio, reached such proportions just before the holidays that the weekly electrical page was increased to a double-page spread. This successful campaign of electrical advertising was started by Toledo Jovians during the reign of former Statesman C. H. Felker, and has been continued for more than a year. At present none but Jovians advertise on the page, and this advertising is handled by a committee consisting of Messrs. E. R. Kelsey and H. E. Adams.

Interior Construction

Schedule of Contractors' Wiring Prices at Emporia, Kan.

During the last three years the number of wired houses in Emporia, Kan., has been practically doubled, owing to the activity of the new-business department of the Emporia Railway & Light Company, coupled with the joint efforts of the local contractors in establishing a schedule of wiring prices. Contractors who have been and are now participating in the scheme

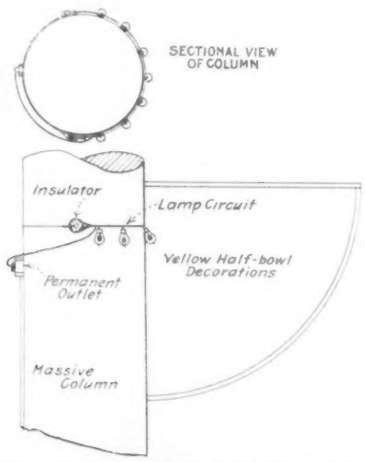
WIRING PRICES FOR FRAME HOUSES

Five rooms with drop-cords	$13.00
Five rooms with drop-cords and porch lamp and switch	17.00
Five rooms with three drop-cords, two two-lamp fixtures with shades, and porch lamp and switch	21.80
Six rooms with drop-cords	15.85
Six rooms with drop-cords, porch lamp and switch	19.85
Six rooms with four drop-cords and two two-lamp fixtures and shades	20.65
Six rooms as above with porch lamp and switch	24.65
Eight rooms (two-story) with drop-cords	20.55
Eight rooms (two-story) with drop-cords and two two-lamp fixtures and shades	25.35
Eight rooms (two-story) as above with three-way switch	32.35
Eight rooms (two-story) as above with porch lamp and switch	36.35

appear unanimous in declaring that their business has never been better than since the co-operative plan has been in force. The schedule of wiring prices used by the representatives of the central station and the contractors is given herewith. Lamps are not included in the prices given in the table.

Saving Time in Decorative Wiring

At the beginning of the holiday season one of the large department stores in Chicago, adopting a color scheme of yellow, placed large electrically lighted pumpkin-like decorations on the many columns in the store. The problem of securing energy for each decoration was simplified by the fact that there is a permanent outlet on each column at a convenient height above the floor.



LIGHTING OF DEPARTMENT-STORE DECORATIONS

In preparation for the job, many strings of lamp sockets, fitted with connection plugs and insulator end-pieces, were prepared in advance by the wiring force. With these strings of sockets ready it was an easy task to attach a light piece of wire to the two insulators at the ends of the string and to adjust the strings at the proper height on the column. Later on lamps were placed in the sockets, the plug connection was made with the permanent outlet, and the decorations were put into position after the wiring had been completed and tested for faults.

WIRING AN OLD FRAME BUILDING

How a Seven-Room House Was Profitably Wired in Approved Fashion at $3 an Outlet

BY TERRELL CROFT

It is the object of the writer to describe in detail the procedure followed and the methods used in the recent wiring of a seven-room frame residence that was erected about twelve years ago. The floor plans of

FIG. 1—VIEW OF SEVEN-ROOM HOUSE

the building are shown in the accompanying illustrations. While there is nothing particularly novel in the installation, it is typical of many that are now being made throughout this country and of a great many more that must be made before the field that is now available to the central stations is saturated.

The desideratum in this instance, as is frequently the case with frame buildings of the type illustrated, was to get a fairly good electric-lighting system in the house. It was piped for gas when built, but the owner had difficulty in renting it without electric lighting. He put in the simplest possible electric outfit and omitted all frills.

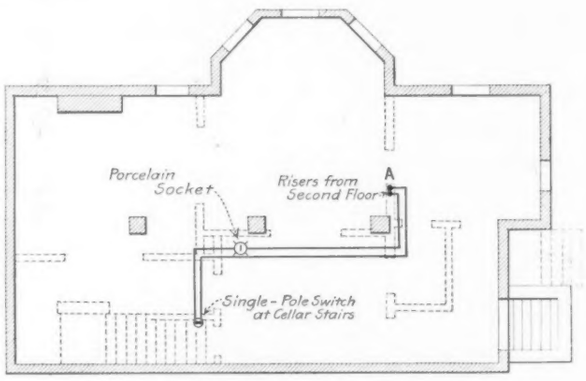


FIG. 2—PLAN OF BASEMENT

It was decided to install flush wall switches only in the principal rooms. The living-room, library and dining-room were to have them, but the kitchen, bedrooms and bathroom were to be provided with pull-socket fixtures. The two hall lamp outlets, one up-stairs and one down-stairs, were to be controlled by two flush three-way switches, one in the first-story hall and the other

in the second story at the head of the stairs. For the cellar one porcelain key socket was to be provided, controlled by a surface wall switch in the cellar-stair entry. A porch lamp, baseboard outlets and the like were omitted to minimize cost; but provision was made for ultimately placing them with little difficulty provided that conditions necessitated their installation.

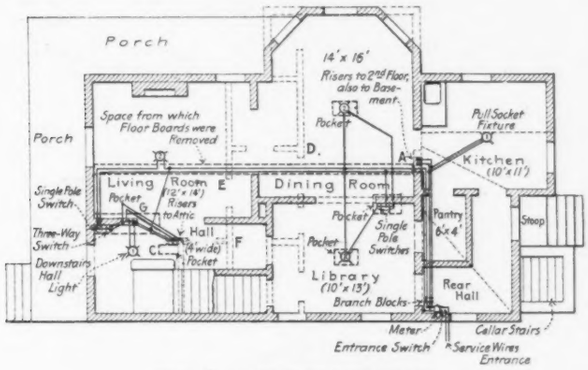


FIG. 3—FIRST-FLOOR PLAN

Fig. 1 is a perspective view of the residence, and Figs. 2, 3 and 4 show respectively floor plans of the basement and first and second floors. Fig. 5 is an isometric view and delineates the arrangement of the entire installation. This illustration is not quite correct in certain minor particulars, which will be indicated later, because it could not be made strictly accurate without confusing complications in drawing.

In an installation of this kind before any actual work is done the first step should be to make a survey of the premises. The "lay" of the floor beams and partitions should be noted and the wireman should, if possible, plan the run for every wire before he makes any openings in exposed places and before he locates his entrance. The cellar and the attic should be visited and all of the closets inspected. By thus carefully analyzing a building it is frequently possible to economize in labor and material. Sometimes a raceway, built for pipes or due to some builder's freak, can be located extending from basement to attic and which will accommodate the risers. Horizontal paths may frequently be similarly located. It may be necessary to bore some holes in the attic or cellar and to remove a few boards in closets or in other unexposed locations and to probe

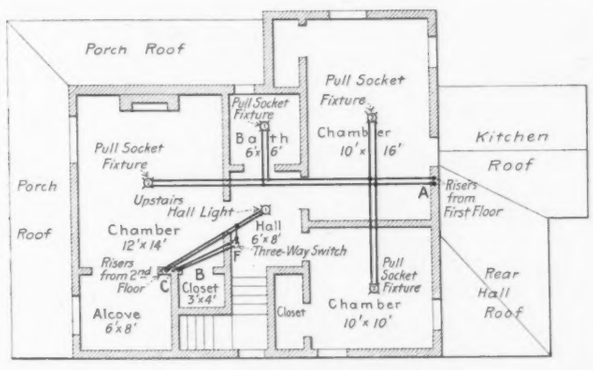


FIG. 4—SECOND-FLOOR PLAN

with a fish wire to determine the most suitable routes for the wiring. In any case no holes for switch boxes or electrolier outlets should be made in walls or ceilings until the wireman is reasonably sure that he can get his conductors to them. Some skilful old-building wiremen never make a hole for a switch outlet in a wall until the raceway for the conductor is complete to the switch and a fish chain has been dropped down and sounded within the partition for verification.

In the particular installation being described the first step was to survey the residence carefully. It was discovered by probing with the fish chain (a heavy linen cord having a couple of feet of small chain tied to one end) that a vertical raceway, indicated at *A* in Figs. 2, 3 and 4, sufficiently large to accommodate several conductors, extended from the basement ceiling to the roof. This was obviously the logical location for the risers. It was found that there were no obstructions in the attic, that it had no floor and that from it the entire ceiling of the second story could be reached, rendering the installation of the principal part of the work on that floor easy. The floor boards of the second floor ran lengthwise of the building, and enough of them were taken up to indicate that a branch circuit could be readily carried within the first-floor ceiling the length of the house, as outlined in Fig. 3, to serve the wiring for the first story. The selection of the routes for the conductors for the two hall outlets, one on the first and one on the second story, and for the three-way switches controlling them gave some trouble. Finally, however, after cutting a couple of exploring pockets, one in a closet (*B*, Fig. 4) and the other in the inconspicuous corner *C*, the wire route shown was determined.

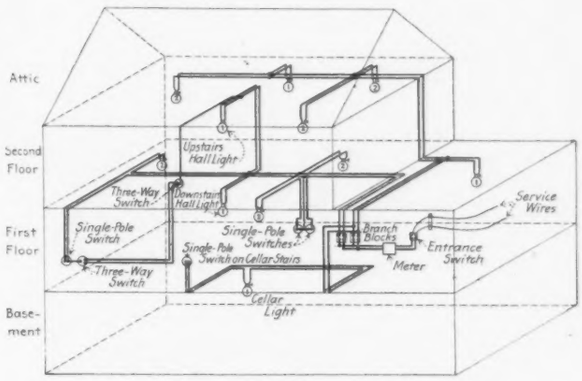


FIG. 5—ISOMETRIC PLAN OF WIRING

The general lay-out of the wire routes having been decided upon, the next move was to locate the point of entrance of the conductors into the building and the best location for the meter and the entrance switch. As shown in Figs. 3 and 5, the entrance was made near the rear of the house into the back hall. The local central-station company specifies that the interior wiring between the point of entrance and the meter shall be as short as possible and also that the meter be placed where it will be clean and dry and where it can be easily inspected and read. The rear-hall location satisfied all of these requirements. The actual arrangement of the equipment about the point of entrance is detailed in Fig. 6. This portion of the job was very quickly placed because the interior of the rear hall had never been finished. The outside wall at this point consisted merely of clapboarding nailed to 2-in. by 4-in. studs. The loom-incased entrance wires were brought into the hall and to the entrance switch each through a $\frac{5}{8}$-in. hole bored through the clapboarding. A vertical cleat was nailed to the face of each of two adjacent studs (see Fig. 6), and to these cleats were spiked two boards. One was for mounting the meter and branch blocks and the other was for the entrance switch. The entrance switch is of the porcelain-base, knife-blade type and is provided with receptacles for Edison plug cut-outs. The retail price of one of 30-amp rating, the size used, is 50 cents. From the inner side of the entrance switch

the conductors pass to the meter and from the meter to the branch blocks, which in this installation constitute the distributing center. Where there was any possibility of the conductors coming closer together than the minimum distances specified by the Code they were incased in loom. It is cheaper in a confined situation of the sort illustrated in Fig. 6 to cover the conductors entirely with flexible tubing or loom than it is to use loom on part of the wiring and support the rest on porcelain.

Another feature that must be considered before much work is done is the assigning of the different outlets to branch circuits—that is, how many branch circuits should be used and what portion of the building each branch circuit should serve. The Code specifies that there shall not be more than sixteen sockets, or, instead, 660 watts of incandescent lamps served by any one cut-out. In the installation under discussion there are exactly sixteen sockets, or, assuming that a 40-watt lamp would be used in each socket, the total load would be 16 x 40 = 640 watts. Evidently it would be possible

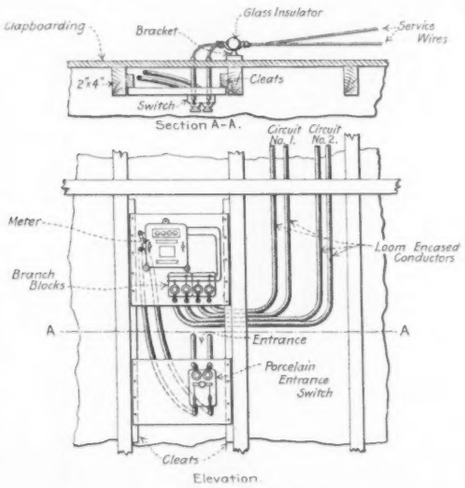


FIG. 6—SERVICE ENTRANCE

to connect all of the sockets in the building to one branch circuit and yet have the installation meet Code requirements. However, if this were done there would be no means available for outlets that might be added in the future, and the installing of an additional branch circuit after the job had been completed and the floor openings closed would be very expensive. Hence it was decided to provide two branch circuits. One circuit was arranged to feed the second story and part of the first, and the other most of the first story. The cellar lamp outlet was connected to the branch serving the second story because in the second story there are seven sockets while in the first story there are, including the second-story hall outlet, which must be fed from the first-story branch, nine. Furthermore, a large proportion of lamps on the first floor are likely to burn at one time, whereas this is not so apt to be true of the lamps on the second floor. The outlet in the kitchen was also connected to the second-story branch circuit to diminish the load on the first-story branch.

Ordinary two-wire porcelain Edison-plug cut-outs costing 25 cents each were used for the branch blocks, as indicated in Fig. 6. Edison plug fuses of 10-amp rating were used for the protection of each wire. Both branch circuits were of No. 14 rubber-covered wire, and No. 10 wire was used from the outside of the building to the entrance switch.

Frequently it is desirable to locate the distribution center at a point near the center of the building that is served. In the case being considered this would have cost more and the desirable feature of having the distribution center near the entrance switch would have been lost.

In installing the wiring for the first floor outlets the first operation was to remove three floor boards the entire length of the building as indicated in Fig. 3. The course of this long "pocket" was so selected that it passed directly over the living room electrolier outlet, rendering the cutting of a separate pocket for this outlet unnecessary. The pocket passed through the doorway at *D* but under the partition at *E*. Pockets were cut over the library and dining-room outlets, and the tap conductors for them were readily fished between the joists to the branch conductors in the long pocket. These branch conductors extending the length of the building within the second-story floor were threaded through tubes resting in holes in the joists. The tap conductors to the outlets were supported on porcelain knobs held to the faces of the joists with nails driven through leather washers and then into the knobs. For carrying the wires to the two single-pole flush switches for the library and dining-room outlets respectively it was necessary to cut a pocket over the partition between the dining-room and the library. The conductors were carried down within the partition in circular loom. The outlet for the living-room electrolier was wired from the long pocket and its single-pole flush switch was wired by cutting a pocket over the partition between the hall and the living-room. The method of getting the conductors to the hall outlets and to the three-way switches controlling them will be described later.

All of the wiring for the second-floor outlets, with the exception of that for the hall lamp, was placed with little difficulty. One of the branch circuits from the distribution center was continued as a riser from the point *A* (Fig. 3) in the first-story ceiling to point *A* (Fig. 4) in the attic over the second story. Then the branch was extended horizontally almost the length of the building—far enough to tap the outlet for the front chamber. In the attic the conductors were supported on the upper edges of the joists on split porcelain knobs held in position with nails. The attic could be entered by a trap door in the bathroom ceiling, and there was ample space in it for the wireman to move about and do his work.

Although the method of wiring for the hall outlets and of connecting the two three-way switches controlling them is shown in the floor plans and in the isometric view, it is better illustrated in the detail of Fig. 7. It will be noted from a study of the floor plans that it was not feasible to route the conductors required for these lamps and switches along as short a path as would have been possible with a job in a building under erection. An inspection of the construction of the residence disclosed that the most economical wiring would be as suggested in Fig. 7. The conductors for the first-story three-way switch were carried down from the ceiling within the partition incased in circular loom. Then all of the conductors were carried, incased in loom, within another partition between the second-story floor and its ceiling (Figs. 3, 4 and 7), and then the three conductors for the second-story three-way switch were carried back down still another partition. The reason for adopting this routing is not altogether obvious from Fig. 3 because parts of it are not drawn quite to scale. Actually the down-stairs hall outlet is so close to the pocket *C* that it was readily wired from *C*. Also the bottom of the partition in which the four risers to the attic are installed was available from *C*. Hence it was easier and cheaper to carry all of the hall lamp wiring up inside the partition at *C*, and then to bring the switch wires back again in partition *F*, than it was to carry the conductors over to *F* within the first-story ceiling,

which would necessitate cutting another pocket in the second-story floor under *F* and the removal of more floor boards. The conductors for the hall wiring were incased in circular loom within the partitions. In ceiling spaces they were carried by knobs and tubes, and in the attic they were supported on porcelain split knobs nailed to the joists.

For illuminating the cellar only one porcelain socket was installed in the beginning. It was placed midway

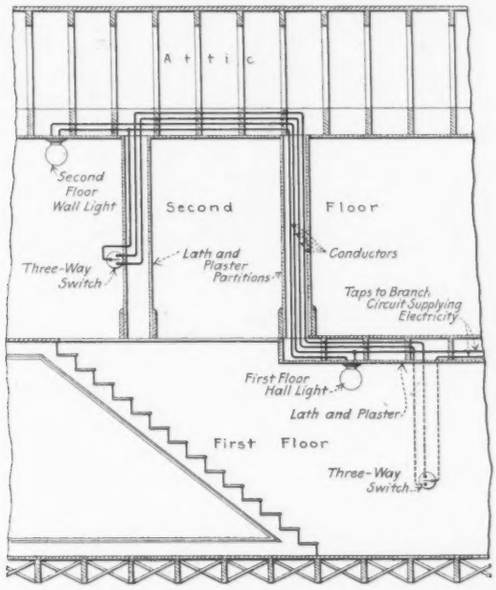


FIG. 7—ECONOMICAL ARRANGEMENT OF CONDUCTORS

between the furnace and the coal bin. The tap circuit for the cellar outlet was connected to its branch at the point *A* (Fig. 3) in the little attic over the kitchen, and the riser was dropped down within the partition *A* to the cellar, where the tap was carried to the socket and to the surface wall switch in the cellar stairway, as indicated in the basement wiring plan (Fig. 2). As previously suggested, the cellar lamp was connected to the up-stairs branch circuit. The connection was effected at the point *A* (Fig. 3) because there was a straight runway, left by the house builder, direct to the cellar from this point. This route could be followed without any boring or cutting, hence the loom-incased risers were drawn into it. In the cellar the wires were run at right angles to the joists and threaded through holes that were bushed with porcelain tubes. Where running parallel to the joists the wires were supported by split knobs nailed to the joist faces. Where the conductors were carried up within the partition to the surface wall switch they were incased in loom.

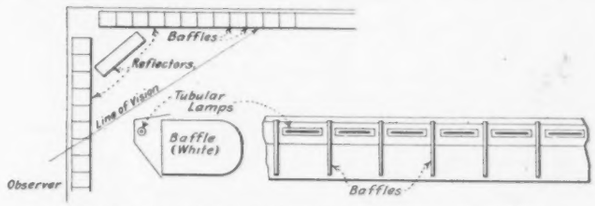
The isometric view of Fig. 5 is included to give a general idea of how the wiring for the entire installation was routed and of how it was connected. However, the basement branch circuit actually connects to the second-story branch circuit near the point where the kitchen outlet taps off, instead of at the branch block as shown by the drawing. The routing for the wiring for the hall lamps and their switches is actually arranged as shown in the floor plans and in Fig. 7, instead of as indicated in the isometric view, although the circuit of the isometric view is correct.

The installation was made by a local electrical contractor. His price for roughing in—that is, for the job complete with switches but without fixtures—was $48. This is at the rate of $3 an outlet, counting each switch and lighting fixture position as an outlet. The work required the time of a wireman and one helper for two days and netted a comfortable profit for the contractor.

Lighting Practice

Concealing Lamps in Corner Show Windows

Displays in corner show windows offer problems in lighting which do not enter when the window faces only one street, because lamps which are entirely invisible from one side of a corner window often shine directly into the eyes of an observer standing on the other side.



BAFFLES TO HIDE LAMPS IN CORNER WINDOWS

One Chicago store has eliminated this objectionable glare in its corner windows by using white-enameled baffles in front of the reflectors. The general arrangement of the baffles, reflectors and lamps, which in this particular installation are suspended near the top of the show window, will be made clear by reference to the drawing reproduced above.

New York's Latest Spectacular Sign

The accompanying illustration shows the "Kleanwell" sign recently erected by the O. J. Gude Company at Broadway and Forty-third Street, New York City. The sign fronts directly upon the heart of Long Acre Square, one of the busiest places in New York City after dark. It is 38 ft. high by 90 ft. long and contains more than 3000 lamps.

In action the two Brownies in the sign tug at the

ANIMATED SIGN OVERLOOKING LONG ACRE SQUARE, NEW YORK CITY

rope, trying vainly to pull out the bristles. Finally the rope breaks. The second Brownie sits down hard and his eyes roll in astonishment at the unyielding nature of the queer plant.

Electric Signs for Merchants' Associations

Almost every city in the United States is the home of some sort of merchants' association, and the more progressive of these bodies are constantly on the alert advocating improvements which will make their business streets attractive. Some of these associations have been instrumental in securing paved streets, some own and operate ornamental street-lighting systems, but the Belmont Avenue Merchants' Club, Chicago, in addition

ELECTRIC SIGN ADVERTISING NEIGHBORHOOD CENTER

to paving and lighting the street, has gone even one step further than the rest. It has purchased a Federal electric sign reading "It pays to trade on Belmont Avenue" and erected it over the street in the geographical center of the Belmont Avenue business district. Charges for energy and lamp renewals for the sign are deducted from the fund made up from regular dues of the association's members, the remainder of the fund being used for maintenance of street lamps and for general expenses.

Mr. E. W. Schiddel, 1048 Belmont Avenue, secretary of the association, recently said that while the first cost of the sign was about $400 the operating expense was but $10 or $12 a month and that all association members were well pleased with the purchase. He also declares that the Belmont Avenue Merchants' Club was one of the first, if not the first, to adopt this type of co-operative electrical advertising.

Successful Fixture Campaign

To enable solicitors and dealers to complete figures giving the cost of fixtures for residence service without delay when talking with prospective customers, the Pettingell-Andrews Company, Boston, Mass., recently prepared a special fixture campaign booklet of sixteen pages, designed to overcome the difficulty formerly encountered by salesmen in being unable to show complete sets of practical equipment for domestic service at low prices, ready for prompt delivery. The campaign fixture sets were selected on the basis that 99 per cent of all residences have a living room, a dining room and a hall, while the conditions in the other less important rooms vary in almost every house. The sets advertised in the booklet consist of three fixtures, one for each of these common rooms, separate fixtures for chamber, kitchen, pantry, cellar, bathroom and porch use being shown independently.

The booklet points out that in utilizing these fixtures the contractor has the advantage of knowing his costs completely, with an added economy in handling equipment carried in stock for immediate shipment and wired complete with key or pull sockets and glassware. It states that there are over 200,000 unwired houses in New England, and emphasizes the importance of being able to approach the prospect with an attractive, concrete proposition involving no guesswork as to fixture costs, in contrast with the usual uncertainties and estimates. All fixtures are shipped within forty-eight

SAMPLE PAGE FROM CAMPAIGN BOOKLET

hours after the receipt of the order. Each booklet contains a net price list printed on a blue sheet and a trade price list printed on pink paper. There are nine sets of fixtures shown in attractive halftones, with tabulated costs ranging from $7.50 to $41.75 per set. Some of these sets enable the small householder to take advantage of semi-indirect lighting. In compiling the booklet the company placed the contractor in possession of sufficient data to enable an average home to be figured on the spot and within a few moments, and as a result upward of $10,000 worth of the fixture sets and accompanying individual pieces have been sold within the last six weeks.

Working the Office Light at Night

Contending that some of the best advertising space obtainable is often thoughtlessly wasted, a new-business manager in a Middle Western city has set out to induce office tenants in down-town buildings to use their windows as lighted signboards at night. To accomplish the latter, he explains, it is only necessary to place a shaded desk lamp back of the sign painted on the window, so that the lamp will illuminate the lettering. This progressive new-business manager also makes practical suggestions to prospective customers concerning ways of securing the help of the building watchman in turning off the lamps after the evening crowds have gone.

NEW APPARATUS AND APPLIANCES

Electric Water Heater

A small electric heater, which, it is claimed, will boil a glass of water in a minute and a half, has recently been developed and placed on the market by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa. The heating element is embedded in a cylinder 15/16 in. in diameter and 4.5 in. long which is surmounted by a metal top large enough to cover the glass vessel in which the cylinder is inserted. The metal cover serves to keep out the dirt and facilitates the heating process. A metal holder is also provided for lifting the glass vessel. The switch is attached to the cover as shown in the accompanying illustration. The device is designed to consume 450 watts.

WATER HEATER

Small-Sized Oscillating Fan

An interesting development for the fan season of 1915 is a 9-in. oscillating fan designed by the Emerson Electric Manufacturing Company, St. Louis, Mo. The fan is adapted particularly to home use, the manufacturers declare, and it has been made light and portable and practically noiseless in operation, especially for this class of service. For alternating currents an induction motor is used which operates at a maximum speed of 1550 r.p.m. With a direct-current motor a maximum speed of 1600 r.p.m. is obtained. The net weight of the fan is 13 lb., and at full speed it takes 35 watts.

The oscillating mechanism is similar in design to the 1914 12-in. and 16-in. models. The mechanism is of the single-link type and is operated by worm and wheel-and-gear and pinion which are inclosed in a gear case at the back of the motor. All parts of the mechanism are removable from the outside, a screwdriver being the only tool necessary. The arc of oscillation is adjustable from 90 deg. to 15 deg., through a range of six positions. A non-oscillating position can also be secured. A safety device is provided so that the arc of oscillation is automatically reduced if the hand guard or motor body strikes an obstacle. By means of a hinged desk-bracket base, the fan can be turned from a straight position to an angular position by removing a screw in its spherical portion. The fan can also be tilted up or depressed if desired. An adjusting collar permits the motor to be swiveled instantly to change the direction of breeze without changing the position of the base. An automatic lock is provided on the adjusting collar which is secured in any one of five positions by spring on the latch handle.

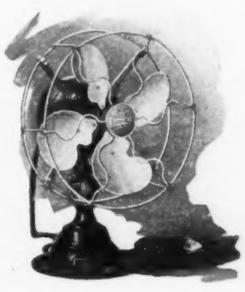


FIG. 1—9-IN. OSCILLATING FAN ON PEDESTAL

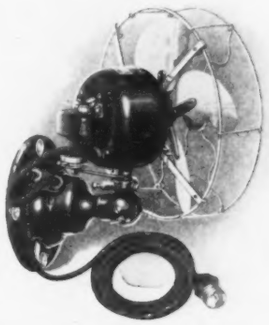


FIG. 2—9-IN. OSCILLATING FAN WITH HINGED BRACKET

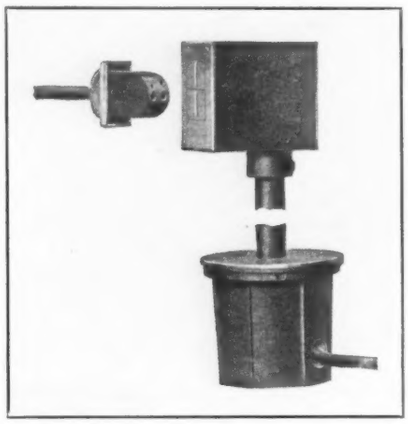
Table Fan

The electrically operated fan shown herewith, is designed particularly for use on dining-room tables. The base has been given a vase-like appearance, in order to harmonize with the usual settings of the table, and is finished in white enamel, while the blades and guards are nickel-plated. The motor will operate on either alternating-current or direct-current circuits, and so-called oilless bearings are employed. The fan can also be utilized on office desks, especially those of the flat-top type, as the air is forced along the plane above the desk and does not disturb papers that might otherwise be blown away. The fan is being placed on the market by the Menominee Electric Manufacturing Company, Menominee, Mich.

ELECTRIC FAN FOR TABLES AND DESKS

Floor-Outlet Extension

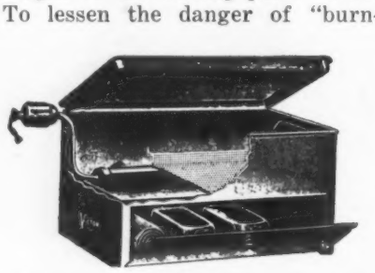
A watertight floor box made by the Bryant Electric Company, Bridgeport, Conn., to which a disappearing door receptable can be connected by means of a piece of rigid conduit as shown herewith, has recently been placed on the market. When not in use the box is sealed by a blank cover. When electrical connection is desired this blank cover is replaced by one having a tapped and threaded hole, into which is screwed the conduit, the other end of which carries the receptacle. A connecting block is provided in the floor box for connecting the branch wires which extend through the conduit to the receptacle. Thus the installation or the removal of an outlet does not disturb the main wires. The boxes are finished in black enamel and are provided with brush-brass plates and a brush-brass plug.



FLOOR BOX WITH DISAPPEARING RECEPTACLE

Electric Sterilizers

Two improved electrically operated sterilizers consisting of a sterilizing and warming chamber and designated as type No. 1 and type No. 2 by the manufacturer, the Victor Electric Company, Jackson Boulevard and Tobey Street, Chicago, Ill., have recently been developed. The heating element is entirely self-contained and can be utilized for heating water in any receptacle. The sterilizing chamber of the No. 1 model holds 3 pt. of water, which, it is claimed, can be boiled in less than two minutes. The sterilizing chamber of the No. 2 type has twice the capacity of the No. 1 chamber, and water is brought to the boiling point in about fifteen minutes. To lessen the danger of "burn-outs" the floor of the sterilizer is tilted so that the last drop of water drains into the trough in which the heating unit rests. In case the water is evaporated down to an ounce or less, there is a low hissing sound which is audible several feet away. The sterilizer is of copper heavily tinned on the inside and nickel-plated on the outside. It is equipped with a hinged cover and rests on short legs so that there is no danger of injuring the woodwork or other material on which it may rest. The sterilizing chamber of the No. 1 device is 5 in. by 10 in. by 2.5 in. and the warming chamber is 5 in. by 10 in. by 2.5 in. The latter chamber is for medicaments, dressings and instruments. The dimensions of the sterilizing chamber of the No. 2 model are 6 in. by 13.5 in. by 2.5 in. and those of the warming chamber 6 in. by 13.5 in. by 2.75 in.



ELECTRICALLY OPERATED STERILIZER

Ceiling Fans for India

In the accompanying illustrations are shown two of several types of ceiling fans designed particularly for service in India by the Robbins & Myers Company, Springfield, Ohio. In Fig. 2 is illustrated a fan with four wooden blades pitched at steep angles and in Fig. 1 one with three concave aluminum blades. The sweep of the blades is 60 in. and upward. Large motors are employed, and ample space is devoted to special insulation on the windings, which is necessary because of the climatic conditions prevailing in India. For the service which the fans are designed good lubrication is essential, and both bearings of the motor are immersed in oil reservoirs which are accessible without disassembling the motors. The motors are designed only for direct current as that is the current generally utilized in India. The fans operate only on one speed and are controlled by a wall switch. The fans are finished in white enamel or black japan.

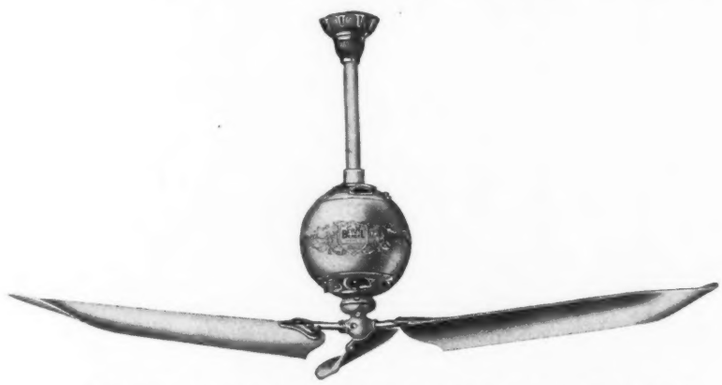


FIG. 1—FAN WITH THREE CONCAVE ALUMINUM BLADES

FIG. 2—FAN WITH FOUR WOODEN BLADES

Desk Push-Buttons for Call System

The push-button block shown in Fig. 1, which may be placed on a desk and form the central station of a calling system, is equipped with connectors with formed

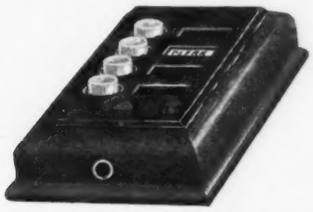


FIG. 1—DESK PUSH-BUTTON STATION

ears to prevent the wire from spreading or slipping out. The ends of the button-head screws are upset so that they cannot be backed entirely out and lost. The contact bridge and all energy-carrying parts are insulated. Phosphor-bronze contacts of the saw-tooth, scraping, self-cleaning type are used. The cards for each button are held fast by phosphor-bronze springs. The mech-

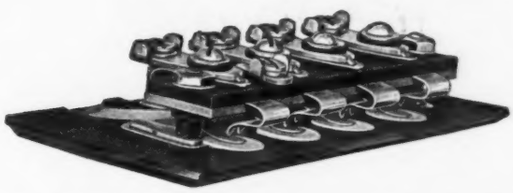


FIG. 2—COVER REMOVED, SHOWING MECHANISM

anism of a calling station is shown in Fig. 2 with cover removed. The apparatus is being placed on the market by Edwards & Company, 140th Street and Exterior Street, New York.

Boxes for Loom-Wiring

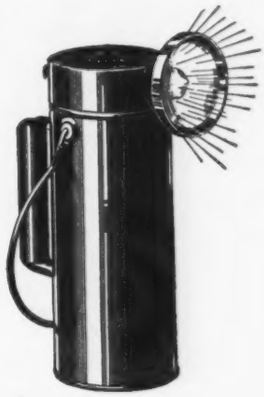
To meet the demand for outlet boxes which can be employed at outlets where loom or knob and tube wiring is used, the Sprague Electric Works of the General Electric Company, 527 West Thirty-fourth Street, New York, have developed eighteen different types of boxes. Nine of these boxes are provided with ears so that a special octagonal cover or standard round or octagonal covers may be utilized. These boxes embody practically all the usual combinations of outlets, the manufacturers claim, and in each box is sufficient room to make the necessary splices and joints in the wire. The knockouts are $\frac{5}{8}$ in. in diameter, and they can take standard 0.5-in. loom. The center knockout is 1 1/16 in. in

OCTAGONAL BOX AND ROUND COVER

diameter, and therefore is large enough for a standard $\frac{3}{8}$-in. gas-pipe cap; the removal of the cap is not necessary when installing the box. The conduit knockouts are designed for 0.5-in. conduit. The boxes may be galvanized or may be finished in black enamel, as desired. For shipping purposes the boxes are packed in packages containing ten boxes or 100 boxes.

Reflector for Hand-Lamp

A silvered reflector designed for use with a small hand-lamp operating on a single dry cell has recently been developed by the Delta Electric Company, Marion,



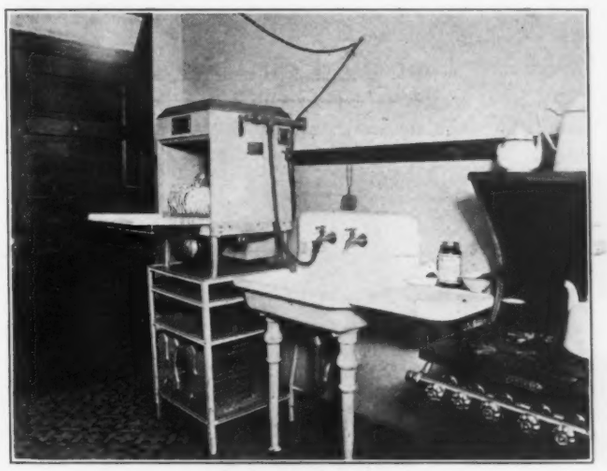
HAND-LAMP EQUIPPED WITH SILVERED REFLECTOR

Ind. In the accompanying illustration is shown the reflector used with a lamp made by the above company.

Motor-Driven Dishwasher of Household Size

Practically all modern hotel kitchens are provided with motor-driven dishwashers, but few private households have yet adopted this sanitary and labor-reducing method of cleansing tableware. An electric dish-washing machine measuring 64 in. in height, 24.5 in. in depth and 22.5 in. in width, and equipped complete with an iron stand and dish racks, has been recently put on the market primarily for household use.

Beneath this small machine a 0.1-hp motor, with its shaft extended into a depending water tank, drives a small centrifugal pump which forces hot, soapy water through a set of overhead revolving nozzles at the rate of 20 gal. per minute. This hot water is used again and again, the centifugal pump lifting it from the small tank



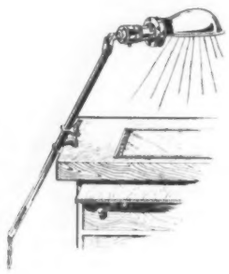
HOUSEHOLD-SIZE ELECTRIC DISHWASHER

which forms a part of the bottom of the washer. When the dishes have been washed thoroughly with soapy water the black-handled valve at the side of the washer is turned, admitting scalding hot water for rinsing the clean dishes. The rinsing water passes revolving propeller blades as it enters the washer and is thus evenly and completely distributed. The rinsing water upon

being admitted also raises the level of the soapy water in the washer tank, and as the water level rises, the grease from the top of the used water escapes through a drain pipe, leaving only clean, soapy water to be used if a second rack of dishes is to be washed. An electric lamp suspended beside a window outside this washer illuminates the interior while dishes are being washed, and is equipped with a long, flexible cord so that the lamp may also be used to examine the interior of the machine. The door has been made easily detachable so that all parts of the interior may be reached with ease. All piping connections are designed to be permanently connected to the kitchen plumbing, but the photograph herewith shows how temporary water connections were made in a Chicago kitchen. This machine is called the "Crescent" household dishwasher and is made by the Bromley-Merseles Manufacturing Company, 1328 Broadway, New York City.

Portable Lighting Fixture

The fixture shown herewith is equipped with a clamp so that it can be attached to a desk, table, chair, piano, bed, etc. The wires are concealed in a universal joint, and the light can be thrown in any direction desired.



PORTABLE FIXTURE CLAMPED TO TABLE

White and black buttons are employed with the socket switch. The shade and reflector are adjustable. The "Spirolote," as it is called, is being made by the C. Spiro Manufacturing Company, 68 East 131st Street, New York.

Swivel Attachment Plug

A swivel attachment plug which is wired without disassembling the device has recently been placed on the market by the Best Electric Company, Pittsburgh, Pa.

ATTACHMENT PLUG

The plug is of asbestos composition and brass screws are used throughout. The binding posts, the manufacturers declare, are easily accessible, and there is plenty of room for wiring. There are two leads from the cap, one for each wire to its binding post.

Clamps for Semi-Indirect Glass Bowls

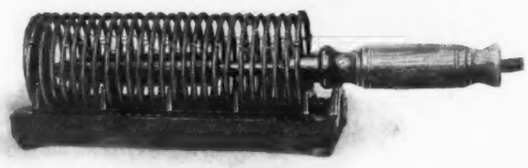
More than forty kinds of ornamental clamps and fasteners have been designed by the Metal Arts & Crafts Company, 617 Jackson Boulevard, Chicago, Ill., for use with large semi-indirect lighting bowls. In the

ORNAMENTAL CLAMPS AND FASTENERS

accompanying illustrations are shown several of these fittings. The clamps are of brass and are designed to conform with the shape of the bowl. They are attached to flanges extending from the upper edge of the bowl or to screws passed through holes drilled through the glass. A hinged or pivoted nipple, a felt washer and a wide jamb nut are provided for use with clamps employed with bored globes. Three or more points of bearing on the exterior of the globe, the manufacturers declare, are obtained with these clamps; the tightening screw or lever, which can be adjusted without tools, bears against the interior surface of the globe. Suitable hooks are provided for the supporting chains or spindles and also for holding pendent lamps in case a spread of outside lamps is desired. Two hooks may be utilized for the chain so that a wide or narrow spread can be obtained. A threaded connection is provided to which the lamp socket is attached.

Soldering-Tool Holder

In the accompanying illustration is shown a cage for holding a soldering or branding tool when not in use. The holder is designed to prevent workmen touching or taking hold of a hot tool and to keep inflammable material away from the hot iron. The device is finished



HOLDER FOR SOLDERING TOOLS

in nickel and is equipped with a black-enameled base. Rubber feet or pads are provided to prevent the holder from scratching a polished table or switchboard. The soldering tool holder is being made by the Vulcan Electric Heating Company, Buffalo, N. Y.

Combination Smoker Cabinet and Lighting Fixture

In the accompanying illustrations are shown combination smoker cabinets and fixtures for reading lamps made of quartered oak and equipped with green or amber art-glass shades. The fixture shown in Fig. 1 is 49 in. high and 14 in. wide, and that illustrated in Fig. 2 is 53 in. high and 18 in. wide. Both sets, which have been developed by the Peterson Art Furniture Company, Faribault, Minn., are provided with ash trays.

FIGS. 1 AND 2—COMBINED LIGHTING FIXTURE AND SMOKING CABINET

Electric Hair Drier

A portable motor-driven hair drier, from which hot air can be obtained if desired, is shown herewith. An aluminum base is used with the heating element. The heating wire is insulated from the base, around which it is wound. In order to make the device as light as possible, the fan and where practicable all other parts are of aluminum. Approximately 10 per cent of the air drawn in by the fan passes through the motor, the manufacturers declare, keeping it cool at all times even when hot air is being utilized. By removing five screws the side casing can be taken from the machines for inspecting the fan and the heating element. The device is finished in black japan and nickel. The drier may also be employed for polishing shoes, drying furs and feathers, gloves, photographic plates, etc. The Victor Electric Company, Jackson Boulevard and Robey Street, Chicago, Ill., is making the drier.

ELECTRICALLY OPERATED HAIR DRIER

Pull-Socket Tap

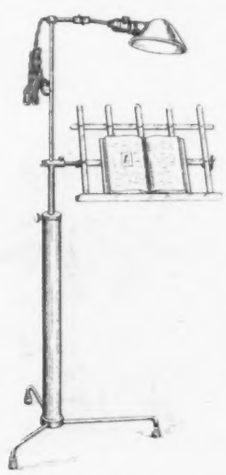
A tap which consists of a pull socket with a lamp-base attachment and an outlet for an extension is being made by the Arrow Electric Company, Hartford, Conn.

TAP WITH A PULL-SOCKET AND LAMP-BASE ATTACHMENT

The extension is controlled independently of the lamp in the pull socket. The device is shown in the accompanying illustration.

Stand for Reading Lamp

A reading-lamp stand consisting of a brass standard to which is attached a rack of sufficient size and strength to hold a magazine or large book is shown in the accompanying illustration. The rack is adjustable to any angle and its height can be varied from 2 ft. 3 in. to 4 ft. It is designed so that it may be used on either the right-hand side or the left-hand side. It can also be removed by loosening one screw in case it is desired to use the lamp only as a floor lamp. The height of the lamp can be adjusted from 2 ft. 6 in. to 6 ft., and it may be removed altogether when the stand is used in the daytime. By means of a friction joint and revolving reflector the light can be directed at any angle desired. The feet and rack are removable, so that it is easy to ship the fixture. All metal parts are finished in brush brass. The stand is being made by the R. M. Millar Electric Works, 9 South Fifth Street, Chicago, Ill.



READING-LAMP FIXTURE

Sewing-Machine Motor

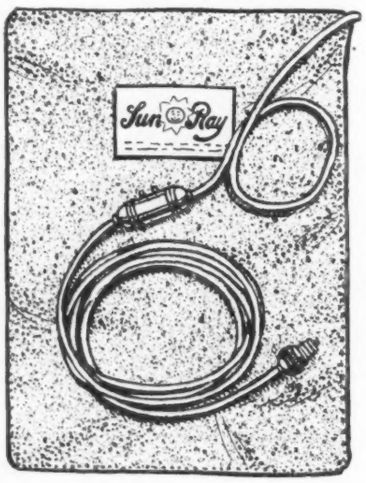
The sewing-machine motor recently placed on the market by the Wisconsin Electric Company, Racine, Wis., is declared to consume no more energy than a 16-cp lamp and is arranged with an automatic switch by which it can be stopped and started at the will of the

SMALL MOTOR FOR USE WITH SEWING-MACHINES

operator. This "Dumore" motor in no way interferes with the ordinary working of the sewing machine. The bobbin is filled in the usual way and the original belt is left in place on the machine. The motor, which operates on either direct or alternating current, is finished in black enamel and has its other metal parts oxidized. Packed in its carton for shipment by parcel post or other means, the motor outfit complete weighs only 6.5 lb. No tools are required to attach the motor to the sewing machine, and connection can be made to any electric-lamp socket.

Flexible Electric Heating Pad

The new "Sun Ray" electric heating pad, which has been developed by the P. & B. Manufacturing Company, Milwaukee, Wis., is soft and flexible as an ordinary piece of cloth. Consequently the pad can be applied with comfort to any part of the body, while the patient may even lie on it without feeling grooves,



ELECTRICALLY OPERATED HEATING PAD

ridges or wires. Two thermostats protect the pad against excessive temperature rise. The three different degrees of temperature are controlled by two push-buttons in the pendent switch on the cord. Pushing one button turns on low heat, pushing the second button gives medium heat, and closing both buttons gives full heat. At these steps the power demands are respectively 18 watts, 36 watts and 54 watts. A single-heat pad is also made by the same manufacturer. Both types of pads measure 12 in. by 16 in. and are covered with heavy, soft eiderdown, rich brown in color. A 10-ft. flexible cord is furnished with each pad, together with a washable slip cover and a separable plug ready for attachment to any socket.

Portable Floor Fixture

The floor lamp shown in the accompanying illustration is of the flexible-shaft style and is 4.5 ft. high. The fixture is equipped with a wide iron base and a reflector, and is finished in brushed brass. White-enamel finish

PORTABLE FLOOR LAMP

is also employed when the device is designed for use in hospitals, dental parlors, etc. The fixture is being placed on the market by the C. Spiro Manufacturing Company, 68 East 131st Street, New York City.

Battery-Operated Hand-Lamp

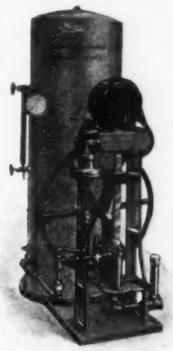
A small lamp which can be attached to a dry cell as shown in Fig. 2 has recently been placed on the market

FIGS. 1 AND 2—BATTERY HAND-LAMP

by the Manhattan Electrical Supply Company, 17 Park Place, New York. The device is of nickel-plated brass. A push of the finger on a sliding button connects the lamp in circuit, and another push disconnects it. One dry cell, it is stated, will give twenty hours of continuous service and forty to fifty of intermittent service.

Automatic Electric House Pump

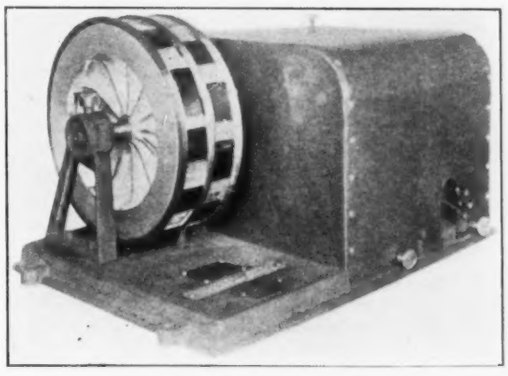
The small electrically operated pumping set shown herewith is designed for use in residences where not more than 120 gal. of water per hour is required and where the supply is not more than 22 ft. lower than the apparatus. A double-acting pump, which is belt-connected or rope-connected, as desired, by means of a 20-in. pulley, to a 16-hp motor, is utilized. It is equipped with a 1.5-in. cylinder and has a stroke of 2 in. An automatic switch opens the circuit when the pressure in the tank is 40 lb. per sq. in. and closes it when it falls to 20 lb. per sq. in. The tank is galvanized and has a capacity of 42 gal. The entire apparatus is mounted on a heavy cast-iron base as shown. The floor space occupied is 18 in. by 20 in., the height is 48 in. and the weight is 300 lb. The pump is made by the Columbus Pump Supply Company, Columbus, Ohio.



ELECTRIC PUMP FOR RESIDENCE USE

Motor-Driven Siren Fire Alarm

To supply the demand of towns and small cities for a means of sounding a general fire alarm, and indicating the locality of the fire, without utilizing a steam whistle, an electrically operated siren has recently been developed. The device is shown herewith and consists of a siren operated by an alternating-current motor. The speed can be changed and the pitch varied accordingly by frequently closing and opening the switch. The range of pitch is practically the same as that of a piano, or seven octaves, running from a deep sound of about sixteen vibrations per second to one of about 700 vibrations per second, which is about the same as high C (two octaves above middle C on the piano). It can be heard, the manufacturers claim, for a distance of five miles. The revolving part of the siren is of aluminum, mounted on Hess-Bright ball bearings, and the outside portion or stator of bronze. The siren gives the best results, it is declared, when operated by a three-phase induction motor. The motor is protected from the weather by a close-fitting metal hood.

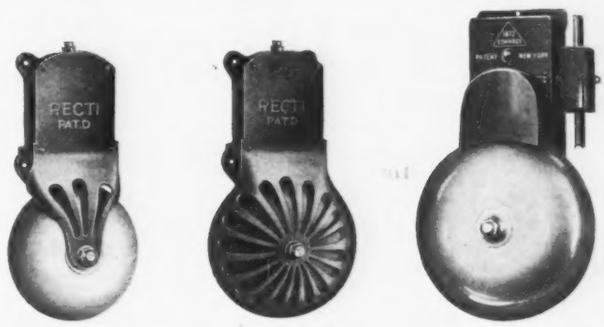


MOTOR-DRIVEN SIREN

The siren is usually placed upon a building or tower near the center of a town, and a roof is built over it to prevent snow clogging up the siren in the winter time. With a motor-driven siren of the type described switches can be placed at various points, from any one of which an alarm can be sounded in case of fire. The siren is made in two sizes, one being operated by a 3-hp motor and the other by a 5-hp motor. The smaller siren occupies a space of 40 in. by 20 in. by 15 in., and the larger one of 55 in. by 24 in. by 21 in. The weight of the smaller is 300 lb. and of the larger 400 lb. The siren is being made by the Hendrie & Bolthoff Manufacturing & Supply Company, Denver, Col.

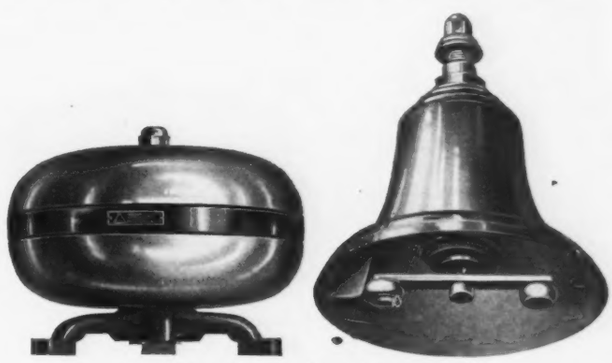
Electric Bells

Several types of recently developed electric bells are shown in the accompanying illustrations. In Figs. 1 and 2 are shown electric signal bells protected with grids to prevent tampering with the hammer rod. The bell gong shown in Fig. 3 is designed for operating on low current, and the mechanism is entirely insulated from the case. Connectors for line wires are at the side of the conduit box. The entire upper half of the conduit box may be removed by taking off two screws. The box is designed for use with surface conduit ½ in. in diameter. For each winding of the mechanism the gong can be operated 350 times.



FIGS. 1, 2 AND 3—BELLS PROTECTED WITH GRIDS, AND GONG

So-called riot bells are illustrated in Figs. 4 and 5. The bells are operated by small motors which may be run by batteries or on alternating-current or direct-current circuits. The "Liberty" riot bell is designed for use on fire-department vehicles only, and is controlled by the driver from a push-button on the steering wheel. Additional buttons may be placed on other parts of the vehicle if desired, enabling others than the

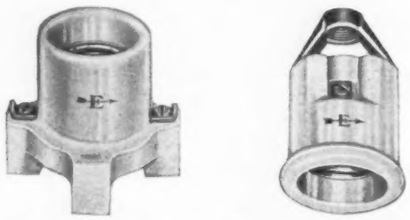


FIGS. 4 AND 5—RIOT BELLS

driver to operate the bell. These bells are the product of Edwards & Company, 140th Street and Exterior Street, New York.

Socket and Receptacle for Large Incandescent Lamp

The socket and receptacle shown herewith are designed for use with nitrogen-filled incandescent lamps. Both devices are being made by the Arrow Electric Company, Hartford, Conn. The socket with yoke is of the same over-all length as a brass-shell socket designed for

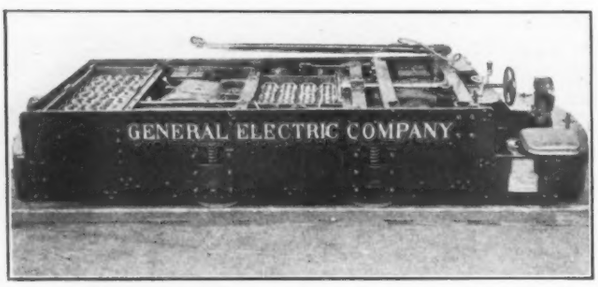


PORCELAIN SOCKET AND RECEPTACLE FOR NITROGEN-FILLED INCANDESCENT LAMP

use with high-efficiency incandescent lamps already placed on the market by the company, and it can be used with fixtures designed for these brass-shell sockets. The receptacle is adapted for exposed wiring, the manufacturer claims, and is so designed that the porcelain lugs projecting below its bottom surface allow an air space between it and the surface to which it is attached.

Combination Storage-Battery and Trolley Mine Locomotive

A definite demand has been noted, it is declared, for the storage-battery locomotive for gathering work in mines, as it has been demonstrated that in this service each locomotive will effectively displace at least two or three mules. Heavy units are not as a rule required, and the locomotives of this class so far provided have been rated at from 3 tons to 7 tons. Most of these locomotives are of the straight storage-battery type, but a



COMBINATION STORAGE BATTERY AND TROLLEY LOCOMOTIVE

limited number have, in addition, been so equipped that they can operate from a trolley wire when in the main headings of a mine. The advantages of this arrangement are obvious, since by means of a small self-contained motor-generator set the battery may be automatically charged while the locomotive is running on the trolley. When the locomotive is working in the rooms gathering the cars a varying percentage of the battery charge will be consumed, but as soon as the operation of the locomotive on the trolley is resumed these losses are automatically compensated for. With this dual system of operation, the battery need never be entirely discharged, and if the available space is limited it permits the use of a smaller battery than would otherwise be necessary. A machine of this type has been in operation in a West Virginia mine for a period of about four months. It runs on a 42-in.-gage track and its over-all height does not exceed 30 in. It was built by the General Electric Company, Schenectady, N. Y.

Lamp-Cord Adjuster

A device for varying the length of a lamp cord has been developed by the Gowan Electric Adjuster Manufacturing Company, Toronto, Ont. It consists of a porcelain base, a drum around which the cord is wound, a shell, supports for the drum, a clutch equipped with steel balls, and a spring. The base is 4.5 in. in diam-

FIG. 1—CLUTCH ARRANGEMENT WITH STEEL BALLS

eter and $\frac{5}{8}$ in. thick. It has three holes for the mounting screws and four holes for fastening to an outlet box. Two $\frac{3}{8}$-in. holes and channel on the back are also provided for the line wires. The spring resembles a clock spring and has a similar action to that of the spring of a shade roller, excepting that it is operated

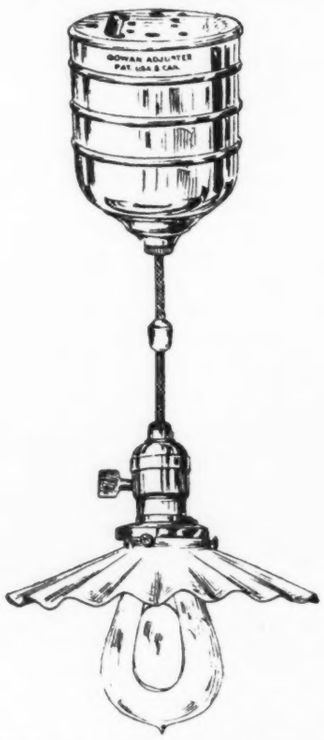


FIG. 2—DROP LAMP WITH CORD ADJUSTER

with a clutch arrangement rather than a ratchet. A soft-rubber bushing through which the cord is slipped is utilized as a "safety stop." The shell is of spun brass, 0.032 in. thick and is insulated. It is attached to the base by a bayonet fastening. All screw heads and nuts are sealed in countersunk holes with a compound which will not melt below 150 deg. Fahr.

CURRENT NEWS SECTION

The National Foreign Trade Convention

The second National Foreign Trade Convention was held at the Planters' Hotel, St. Louis, Mo., on Jan. 21 and 22. It was called by the National Foreign Trade Council in co-operation with the Business Men's League of St. Louis and crystallized the work done by the council during the last year. In addition to the general sessions, there were several group conferences which discussed various problems affecting foreign trade. Among the papers presented were the following:

Adequate Ocean Facilities by Private Initiative

Mr. James J. Hill, chairman of the board, Great Northern Railway, said, in speaking on "Freedom for Our Foreign Trade," that the one indispensable condition of the restoration, extension and maintenance of our foreign trade is the provision from some source of adequate ocean carriage. There are but two resources—one a merchant marine owned and operated by the government, the other a merchant marine provided by and for the people. The former, just now urgently advocated, is an unwise and would certainly be a disastrous experiment. Aside from the complications almost certain to drag us sooner or later into the European conflict, owing to the uncertain and conflicting claims of national neutrality, this policy would be followed by the total destruction of the private shipping interests. An attempt at public operation would be scarcely less disastrous financially than a war. There remains then only the resource, as old as human experience and as unfailing, of dependence on private initiative. Give it a chance. Put it on an exact equality with the other shipping systems of the world. Let the American citizen be authorized to procure and to operate vessels on the same terms as the citizen of any other country is under its laws, and his ability and enterprise will do the rest.

Co-operative Selling

Mr. H. C. Lewis, general manager National Paper & Type Company, New York, in a paper on "Co-operative Foreign Selling for Smaller Manufacturers," said that Germany has made its goods widely known through the sale of a large number of small articles. The German manufacturer has been enabled to do this by methods which are economically wise and beneficial but contrary to the anti-trust policy of this country.

Mr. W. C. Downs, United States commercial attaché for Australasia, in a paper on "Problems of the Smaller Manufacturer and Merchant in Development of Foreign Trade," said that rather than intrust the future of export business to an inferior representative, it would be better for a manufacturer to place himself in the classification of those manufacturers who feel that while they are not justified in assuming the heavy expense of an exclusive traveler they could undertake a portion of it in co-operation with other manufacturers. This method of introducing goods has been tried successfully by several groups of American manufacturers. It was also recommended that the travelers be empowered to appoint in the principal trade centers permanent representatives.

Education for Foreign Trade

Prof. Edwin F. Gay, dean of the Graduate School of Business Administration of Harvard University, in speaking of "Commercial Education for Foreign Trade," said that the United States is just entering upon that transformation in its external trade and its internal economic balance which England experienced over a century ago and which Germany has been accomplishing during the last thirty years. The apparently deep-rooted disinclination for foreign service may be explained or justified by the national economic and social history, but the fact remains that the United States, unlike its European competitors, has at present no considerable surplus of ability for exportation. With its other deficiencies in capital, equipment and organization, its deficiency in experienced men is a serious item. It must be reckoned with and remedied if the United States is to play any great and active part in the world's commerce. It is in response to a demand from business itself, conscious of the growing complexities of modern business operations and of the need for trained intelligences, that American colleges from the Atlantic coast to the Pacific are organizing courses and establishing schools of business administration.

Co-operation Among Manufacturers

Mr. W. L. Saunders, chairman of the board, Ingersoll-Rand Company, New York, in discussing "Government Regulation of Commerce as Affecting Foreign Trade," said that legal advice from those who have studied the subject and are most competent to interpret the situation is to the effect that there is nothing in the Sherman law that prohibits price-fixing, pools and trade combinations of American producers in selling goods for delivery into foreign countries. Apart from legal opinions, it would seem plain that the United States government has no authority in the matter of sales made for delivery to foreign countries. It is not within its province to regulate them, as the concern and control of the government of any country are limited to its own territory. Nor is it necessary for competitors to be established at the foreign point of delivery, for so long as the proof exists that delivery is made outside the limits of the United States it seems plainly within the province of any one to co-operate to the fullest extent in negotiating sales. Price fixing is not in itself immoral nor is a monopoly immoral. They are both wrong when they are unfair or are contrary to the public welfare or when they are construed as unlawful acts, and in this case unlawful acts are such only as are unfair or contrary to the public welfare. In all the suits brought by the United States under the anti-trust acts there is no single instance of prosecution because of conditions involving export trade nor are any suits likely to be brought. It may be best for those who doubt the interpretation of the law to bring a test case rather than to expect Congress to pass permissive legislation.

Financing Foreign Trade

In talking on "Foreign Banking, Loans and Credits," Mr. John J. Arnold, vice-president First National Bank of Chicago, said that reciprocal banking arrangements for the purpose of financing transactions between the two countries concerned have undoubtedly proved very successful and satisfactory, but where such countries are both interested in the development of trade with a third nation it is absolutely illogical and unreasonable for one country to be successful when it is compelled to do its financing with the third party

through the banking institutions owned and controlled by its competitor. This is exactly what we have had to contend with in our efforts for trade development in Central and South America and the Orient. Mr. Arnold would like to see the banking laws amended so as to permit American banking institutions to subscribe not more than an aggregate amount equal to 5 per cent of their respective capital toward the capitalization of foreign banks.

Mr. John Bassett Moore, formerly counselor of the State Department, in discussing "Problems of War and Commerce," said that if, instead of the naval supremacy now exercised in its own interest and in that of its allies by the largest consumer of our agricultural products and foodstuffs, the control of the seas were actually contested by powerful hostile fleets it is almost appalling to reflect upon what might be the present state of our commerce.

More Liberal Drawback Laws Required

Mr. Maurice Coster, manager of the foreign department of the Westinghouse Electric & Manufacturing Company, in discussing the need of more liberal drawback laws, said that the United States government to-day authorizes the Secretary of the Treasury to refund part of the duties paid on materials used in the manufacture of articles exported. These refunds are known as the drawback of duties. More liberal laws controlling the subject are required in order to encourage our export trade and to put this country on a competitive basis with other nations. Since the first drawback law was passed in 1789, much has been done to simplify it and to make it work for the benefit of the American producer, especially in 1890 when the McKinley tariff act was passed, increasing the amount of refund from 90 per cent to 99 per cent.

It behooves us now, however, to continue the good work already started and to have a law enacted which will either eliminate entirely the payment of duties on materials used in the manufacture of articles exported or, where duties have been paid, refund the entire amount of such duties.

Why not eliminate this 1 per cent of duties altogether? asked Mr. Coster. All internal-revenue taxes paid on alcohol are refunded when articles of which alcohol forms a part are exported. If these internal revenue taxes are refunded, why should not all import duties be refunded? Any retention of duty by the government is a handicap to the exporter and a loss to American labor. What is needed is the appointment by the government of a commission which would, upon request by the manufacturer of exported goods, look into his responsibility and the importance of his factory. In the case of a favorable report, finding the manufacturer to be responsible and to have good credit, he should be allowed to import any articles which are intended for export at a later date duty free, without having to pay the duty as now required under Section O of the present tariff act. Corporations or firms of doubtful credit or responsibility should be made to furnish a bond equal to or larger than the full amount of duty, but should not be asked to pay the duties if they can furnish proper bonds. One year should be permitted the importer of the material to export the same, with a possible extension, upon request, of three months, making a total of fifteen months within which to export the manufactured article. In case of failure to export within the prescribed time, duty should be required to be paid in full with a penalty or additional duty of, say, 25 per cent.

Where importers are not sure of being able to export all the material imported, they should have the option to pay the duty in full and secure a certificate of importation, which certificate could be sold to exporters, to whom the full duties should be refunded when it can be proved to the satisfaction of the government that the articles produced from duty-paid materials are actually exported, no limit of time of exportation to be imposed in the latter case.

A great many governments encourage their export trade by paying liberal bounties on exported material. There are objections and good objections to paying bounties, but the government, by enacting more liberal drawback laws, could obviate all objections and secure all advantages attached to the payment of an export bounty.

The Engineering Foundation

At the ceremonies to be held on Jan. 27, in the Engineering Societies Building, in connection with the inauguration of the "Engineering Foundation," to which reference was made on page 130 of the ELECTRICAL WORLD dated Jan. 9, the following speakers will be heard: Mr. Gano Dunn, president of the United Engineering Society and past-president of the American Institute of Electrical Engineers; Dr. Henry S. Pritchett, president of the Foundation for the Advancement of Teaching; Dr. Robert W. Hunt, past-president of the American Institute of Mining Engineers, and Dr. Alexander C. Humphreys, past-president of the American Society of Mechanical Engineers.

The initial gift for the Engineering Foundation has been made by a noted engineer whose name will be announced at the ceremonies.

Insurance Saving and Concentric Wiring Discussed by Illinois Contractors

At the midwinter meeting of the Illinois Electrical Contractors' Association held at the new Morrison Hotel, Chicago, Jan. 15 and 16, Mr. H. N. Tolles, of the Sheldon School of Salesmanship, Chicago, opened the first session with a forceful and enthusiastic talk on selling. Mr. Charles Umbach, president of the R. Williamson Company, also addressed the contractors on "Practical Organization Work." Others who spoke in the open session were Mr. G. B. Muldaur, of the Society for Electrical Development, and Mr. G. W. Hill, special representative of the National Electrical Contractors' Association.

In the closed sessions Mr. E. J. Burns, secretary and treasurer of the Illinois association, submitted some data showing that during ten months the Illinois contractors' plan of liability insurance had saved those members adopting the plan in Illinois an average of $66.23 apiece. By the same plan Iowa contractors have succeeded in saving an average of $27.20 apiece. In Illinois the total saving to the thirty-eight members subscribing was $2624.30, and in Iowa, where nineteen contractors entered into the plan, $516.90 was saved.

However, the association itself was shown to be somewhat in debt owing to the fact that the falling off in the majority of the contractors' business had decreased the association's revenue, some of which is derived from an assessment of one-twentieth of 1 per cent upon the gross receipts of members. Forty-four members with enthusiasm and generosity donated a total of $220 to meet the existing deficit.

Besides aiding its members in securing reductions in insurance premiums during the past six months, the Illinois association has succeeded in securing segregation of the electrical contracts from the general contracts in all State work. It is estimated that this move on the part of the State authorities has turned over to

the electrical contractors about $250,000 worth of work that would have gone to the general contractor. While this change is of direct benefit to the electrical contractors, it is also beneficial to the State, for in the past it has been common practice for the general contractor securing a job to sublet the electrical work for a set price to the electrical contractor. On all jobs the electrical contractor, of course, tried to secure a profit, and then the general contractor generally made twice as much profit on the electrical work as the electrical man. Hence the electrical work done through a general contractor really carried a threefold profit. With the present arrangement it is said that better work will be secured at a more reasonable price.

Contractors Oppose Concentric Wiring

One topic upon which practically all delegates agreed was that the advent of concentric wiring at this time is undesirable. After listening to a review of the recent developments along this line by Mr. Ernest Freeman, of Chicago, a resolution was passed declaring the Illinois contractors "to be opposed to the manufacture and use of concentric wire on account of the inferior construction and consequent danger likely to attend its installation." It was generally conceded that the introduction of concentric wiring would reduce the contractors' business. Those who expressed themselves as being opposed to the use of this wire were Messrs. William McGuineas, Ernest Freeman, W. A. Jackson, J. H. Pierce and A. M. Wilmersdorf, Chicago; Guy Carlton, Bloomington, and W. J. Ball, Moline.

The entertainment features of the convention were unusually elaborate, and the registered attendance, reaching 204, broke all records. The next semi-annual convention of the association will be held at Peoria in June.

Convention Plans Discussed in San Francisco

Plans for the San Francisco convention of the National Electric Light Association, to be held on June 7 to 11, were discussed at a meeting held in San Francisco, on Jan. 20. Messrs. T. C. Martin, secretary, and George W. Elliott, master of transportation, went from New York to meet with the local San Francisco committees. Reports were made to the general convention committee by the chairmen of the sub-committees on entertainment, finance, hotel, local transportation, ladies' auxiliary, local registration, information and publicity. It was decided that the convention shall not be held in the Exposition auditorium at the civic center but in the Native Sons' Hall, which has a central location and a main hall capacity for 1500 people.

Co-operative Buying by Canadian Electrical Association

The Canadian Electrical Association has completed plans for co-operative purchasing by member companies. Mr. Alan Sullivan, secretary-treasurer, writes to the ELECTRICAL WORLD that the association is in the market for a very large quantity of carbon and tungsten lamps, meters, transformers and rubber-covered and weather-proofed wire. The purchasers will be operating companies in good standing, and they will include the largest organizations in Canada. Copies of specifications, etc., may be secured for bona fide tenders from Mr. Sullivan at his office at 10 Adelaide Street East, Toronto, Ont.

The new movement of the association is the result of a good deal of work. It is felt by the association that not only will the central-station companies be benefited materially but that manufacturers will also be assisted substantially by the fact that the association has now standard specifications for practically all the requirements of most of the Canadian operating companies.

Output of Large Generating Systems

The accompanying table gives statistics for 1914 on the output, peak load and load-factor of the large generating systems of the country. Similar data for the year 1913 were published in our issue of Jan. 10, 1914, excepting that this year we give information on the Pacific Gas & Electric Company of San Francisco, the Ontario Power Company of Niagara Falls, Ont., and the Pennsylvania Water & Power Company of Holtwood, available for the first time this year. The Ontario Power Company's development is situated on the Canadian side of Niagara Falls and the output is transmitted across the border into the United States beyond Syracuse by the Niagara, Lockport & Ontario Power Company and throughout the Province of Ontario chiefly by the Hydro-Electric Power Commission of Ontario. Somewhat more energy is used in Canada than in the United States, the ratio being about sixty to forty. The energy from the Pennsylvania Water & Power Company is transmitted for the most part to Baltimore, Md., where it is used by the Consolidated Gas, Electric Light & Power Company and by the United Railways & Electric Company.

DATA ON LARGE GENERATING SYSTEMS

System	Peak Load in Kw.	Date of Peak Load	Yearly Output in Kw-hr.	Yearly Load Factor, per Cent
Niagara Falls Power Company	131,520	Jan. 5	906,513,620	78.7
Ontario Power Company	130,500	Sept. 23	781,664,400	68.4
New York Edison Company	229,787	Dec. 23	719,193,535	35.7
Pacific Gas & Electric Company	124,000	Oct. 29	658,208,000	60.6
Penn. Water & Power Company	74,000	Dec. 17	277,200,000	42.5
Philadelphia Electric Company	77,728	Dec. 1	250,697,952	36.8
Boston Edison Company	65,342	Dec. 21	194,137,400	34
Brooklyn Edison Company	49,300	Dec. 9	153,946,900	35.6
Commonwealth Edison Company*	.....	.....	.....	.....

*No data received.

Owing to the restrictions imposed during the year by the War Department on the diversion of water in the United States and by the Canadian government on exportation of electricity from Canada, the yearly output of the Niagara Falls Power Company, which includes that of the Canadian Niagara Power Company, the stations being operated in parallel, is lower than that for 1913 by over 43,000,000 kw-hr. The output of the other systems has increased materially during the year.

Of particular interest are the data on the Pacific Gas & Electric Company's system. The output of that company last year was greater than the combined output of the Philadelphia, Boston and Brooklyn Edison companies, and the load-factor on the system was over 60 per cent, which is a much better showing than that of any of the other companies listed with the exception of the two companies at Niagara Falls.

Apparently the diversity of the loads along the Atlantic seaboard does not vary greatly, since the annual load-factors of the Boston, New York, Brooklyn and Philadelphia companies are not far apart. The Pacific Gas & Electric Company with its greater territory and greater diversity of load, including as it does agricultural, mining, manufacturing, civic, railway and do-

mestic service and with hydroelectric and steam stations, uses its generating equipment to excellent advantage in carrying that load.

Company Not Required to Furnish Low-Voltage Direct Current for Theater

The New York Public Service Commission, Second District, has decided that it would be unreasonable to order the Municipal Gas Company of Albany to supply all the kinds of electrical energy that might be needed by its consumers, and it has dismissed the complaint of Mr. F. Ray Comstock, lessee of Harmanus Bleeker Hall, which asked that the company be directed to supply low-voltage direct current suitable for use in the "spotlight" on the theater's stage.

Commissioner Irvine, who wrote the opinion, points out that the company does not refuse to supply several kinds of energy, namely 500-volt direct current for motor service, and four kinds of alternating current for lighting and motor service. The company is willing to supply all of these standard kinds and sizes if the theater will install its own apparatus for transforming the current. If, in response to this complaint, the company were to be compelled to install the special apparatus needed either at its plant, thence to be transmitted over special lines, or on the premises, any consumer desiring any special variation of energy might compel the company to furnish it or else be subject to a charge of discrimination. This policy would obviously involve a ruinous duplication of plant and lines throughout the city.

The theater complained that the alternating current in the spotlights sometimes produces a sharp buzz in the spotlight apparatus and that the lights had to be watched very closely lest this sound, said to somewhat resemble that of human osculation, interrupt performances.

Large New-Business Meeting in Cleveland

The committee on new business co-operation of the Ohio Electric Light Association met at the Hotel Hollenden, Cleveland, on Jan. 20. More than 100 Ohio central-station sales managers and salesmen were present. Following an address of welcome by Mr. R. H. Wright, Cleveland, the chairman, Mr. Thomas F. Kelly, of Dayton, introduced Mr. T. E. Simpers, Westinghouse Electric & Manufacturing Company, who spoke on "Applications of Electric Drive in Flour Mills." The paper was discussed by Messrs. F. B. Steele, Dayton; H. G. Bonner, Elyria; L. Beecher, Hillsboro; R. J. Busey, Alliance; R. T. Kaigin, Cleveland; F. E. Schornstein, Cincinnati; J. E. North, Springfield; H. B. Bixler, Akron; O. A. Aceef, Massillon, and J. C. Matthieu, Dayton.

A joint lunch was held at noon with the Electrical League of Cleveland and the Jovian chapter. President Morris A. Black of the Cleveland Chamber of Commerce addressed the guests.

Nitrogen-Lamp Business

A paper by Mr. W. A. Wadsworth, of Cincinnati, on "Securing Business with the Nitrogen-Filled Lamp" aroused lively discussion at the afternoon session. Mr. Wadsworth told how his company has installed 1200 new high-efficiency units, with the result of increasing its load by 650 kw of additional business. Lamp life, renewals, effect on other business, appearance of bare units, etc., were mentioned during the ensuing discussion by Messrs. E. A. Beckstein, Sandusky; N. Boynton, Cleveland; F. C. Morrison, Newark; G. A. Lowther, Sandusky; R. H. Wright, Cleveland, and A. K. Young, Toledo.

Mr. L. E. Smith, General Electric Company, Lynn, Mass., discussed "Applications of Motors up to 25 Hp." Mr. J. C. Matthieu, power engineer of the Dayton Power & Light Company, closed the program with a paper discussing opportunities for central stations in the acquisition of industrial truck business from factories, railroads, etc.

In the evening a joint meeting with the Cleveland Section of the Electric Vehicle Association was held, followed by attendance at the automobile show, where "electric-vehicle night" was celebrated.

Twenty-six of the sales staff of the Toledo Railways & Light Company attended the convention, making the trip in a special car.

The Argon Lamp

There was some discussion in the anterooms regarding the 100-watt argon lamp, which is nearly ready for the market. It was learned that the associated lamp companies expect to announce on Feb. 8 their readiness to supply commercially the new 100-watt argon-filled lamp on which their research laboratories have been working. The new gas-filled unit will have a specific consumption of 0.75 watt per candle, approximating that of the present 200-watt nitrogen-filled lamp. Argon, one of the rarer, inert elements of atmosphere, is concentrated by a liquid-air distillation process. Owing to its physical properties, specific heat density, etc., argon is found to be superior to nitrogen for use in bulbs of smaller sizes. A tremendous demand is expected for these lamps, and already, it is learned, large advance orders have been booked.

N. E. L. A. Report on Standardizing Plugs and Receptacles

A provisional report on plugs and receptacles has been adopted by the committee on wiring existing buildings of the Commercial Section of the National Electric Light Association. It has been submitted to the executive committees of the main body and the Commercial Section and is given out for publication in advance of its presentation at the June convention in order that it may receive consideration before that time. Mr. R. S. Hale is chairman of the committee.

The task of standardizing plugs and receptacles was assigned to the committee two years ago. Largely on account of patent difficulties, the committee made no progress at first. It was found, however, that in some cities underwriters and other inspectors were forbidding the use of receptacles on lighting circuits and requiring that they be installed on separate circuits. In past reports the committee has made suggestions which, if adopted by the underwriters, would have obviated this difficulty but they refused to take any action

"Plug" in the report means the cap of separable plugs as well as the whole plug whether separable or non-separable. The committee recommendations are:

"Plugs and Receptacles for Lighting Circuits Alone Considered.—For the moment we should confine ourselves to the class of small plugs and receptacles suitable for use on lighting circuits. The line of demarcation at present is 660 watts, or 6 amp, at 110 volts. Plugs and receptacles of larger capacities are chiefly for charging storage batteries and are being standardized by other committees. In any case they are not considered in this report except as noted.

"Articles on List.—The committee has prepared the following list of the small plugs and receptacles. Some of these have in the past been rated as good for higher wattages than would be allowed on lighting circuits, but it is understood that the manufacturers of the articles

here listed have agreed to use all reasonable effort to keep their plugs off any devices taking more current than is allowed on lighting circuits, even if such plugs and receptacles are actually safe with a higher current than the highest permissible load on a lighting circuit. In other words, all the plugs and receptacles in this list will hereafter be nominally rated as good only for 660 watts or less, and as not proper for use on devices that take over 660 watts, so long as this remains the capacity allowed on lighting circuits.

"In this report the various types are referred to by the manufacturers' names, on the understanding that this describes them sufficiently for all practical purposes. The output of a given manufacturer may, for instance, include wall receptacles, floor receptacles, separable plugs and receptacles, angle receptacles, etc. They will all be considered as being in this list so long as the manufacturer does not claim for any plug connecting to such receptacles a capacity greater than the capacity allowed on lighting circuits by the National Electrical Code.

"Polarity Receptacles and Plugs.—None of these are at present included in the list, and unless included in the list these should in future be installed on other than the ordinary lighting circuits. There is good reason, however, why polarity receptacles should be included in this list as approved types, provided the manufacturer of such agrees to attempt to keep them off any device of higher capacity than is allowed on lighting circuits.

"Plugs and Large Devices.—It is understood that such plugs (polarity or ordinary) as these firms may make of larger capacity (15 amp or over) will be made so as not to fit the small-size receptacles.

"Re-rating.—Some of the small-size plugs now made by these firms have in the past been given a rating of 10 amp, but it is understood that ratings of not over 6 amp at 110 volts (660 watts) will hereafter be advertised for the small-size plugs and receptacles in this list. This will not involve any change in the design or manufacture.

"Future Change of Rating.—The limit of 6 amp at 110 volts, or 660 watts, is the present limit allowed by the National Electrical Code on lighting circuits. If the limit allowed by the code should be changed in future, a similar change would naturally be made in the maximum rating of this class of small plugs and receptacles.

"Practice of Members.—It is recommended that N. E. L. A. members (both company and individual) refuse to purchase for use on lighting circuits any receptacles or plugs that do not connect to any of the plugs and receptacles on this list.

"To Manufacturers.—A complete outfit consists of: A, wall or baseboard receptacles; B, plugs that fit in such receptacles (this including the cap of separable plugs), and also C, connectors that have on one side an Edison screw plug similar to a lamp base for use in lamp sockets, and on the other side the receptacle for the cap, the connector and cap together making a so-called separable plug. If the output of any manufacturer does not constitute one portion of a *complete* outfit, such manufacturer should take note of the fact that his product will be omitted when final standardization is effected, and should make early arrangements accordingly.

"Future Improved Devices.—If any new type of plug and receptacle should be developed or presented to the N. E. L. A. (even if not interchangeable with any of those on the list), the N. E. L. A. should, nevertheless, until further notice, be prepared to add it to the list; but the committee hopes that the progress of the industry and the expiration of patents will lead to the universal adoption of only one type, and that one of the types already in use.

"Large Receptacles, or Receptacles for Large Devices Not Suitable for Use on Lighting Circuits.—The committee recommends that no outlets other than lamp sockets, Edison screw-base receptacles or the receptacles on this list be allowed on lighting circuits, and the committee considers that the underwriters and inspectors will be justified in requiring separate circuits, pilot lights, etc., for receptacles not on this list.

"Result if the N. E. L. A. Accepts This Report.—The result of acceptance of this report should be a first step toward standardization. The next step will come when any of the plugs and receptacles on this list cease to be made and give place to better ones, and the final result will be arrived at when only one is left. On account of the patent difficulties alone it would be undesirable for the committee now to select any one type from the list, but if the holders of patents will only license other manufacturers on reasonable terms, the final standardization of plugs and receptacles (similar to the present standardization of the screw lamp base and socket) will be sooner arrived at.

"List.—The ordinary Edison screw-base receptacle is, of course, allowed, and the solid or swivel plug for use in such receptacles or in a lamp socket is, of course, allowed whenever a non-separable plug may be used.

"The other types are as follows: Bryant, Chelten, Cutler-Hammer, Federal, General Electric, Hart Manufacturing Company Diamond H, Hubbell, Paiste, Trumbull."

To this list names have been added and other manufacturers may be included later.

"Since the provisional adoption of the report the following have been presented," Mr. Hale adds, "and should for all practical purposes be considered as in the report: National Metal Molding. This will connect with the Hubbell and, of course, the Hubbell will connect with the National Metal Molding. Benjamin has also applied and may possibly connect with one of the others on the list.

"I am also glad to state that I understand some of the manufacturers are negotiating among themselves with a view to making their plugs and receptacles interconnectable.

"I understand that some of the manufacturers whose plugs and receptacles have certain weaknesses are making plans to drop the manufacture of such and instead to adopt one of the other types, all of which leads toward the standardization of a single type.

"This report does not take up particularly the question of polarity receptacles. The importance of this question is before the committee and will be considered at their next meeting."

Electricity at Panama-California Exposition

The accompanying illustration shows a night view of the Panama-California Exposition, which was formally opened at San Diego, Cal., on New Year's Eve. Although electricity is very generally used throughout the exposition, the spectacular lighting characteristic of former expositions is lacking. The outline system of lighting not fitting in with the Spanish style of architecture followed, some other system of lighting was devised. Arcades on all structures line both sides of every street in typical Spanish style, and in the center of each arch, the arches being spaced 13 ft. on center, is an indirect fixture consisting of an ornamental plaster bowl in which are four 25-watt tungsten lamps. The arches have a warm light tint, giving a pleasing reflec-

tion. The Prado, streets and plazas have acacia trees, spaced 16 ft. apart, and between every pair of trees on the Prado and plazas, or at 32-ft. intervals, is an ornamental staff post surmounted with a 500-watt tungsten lamp. The spacing on other streets is increased to a maximum of 60 ft., and 250-watt lamps are used in an extensive pepper grove where the series system is employed. Outline lighting prevails on the Isthmus, where the concessions are housed, and it is estimated that some 50,000 10-watt tungsten lamps are connected on the decorative circuits in that section. All distribution is underground except along the Isthmus, where poles are erected on both sides of the street behind the concessions.

An 11,000-volt line runs from the station of the San Diego Gas & Electric Company to a 2500-kw substation on the grounds of the exposition. Here the potential is stepped down to 2200 volts and distributed to transformer rooms in the buildings, where it is further transformed to 110-220 volt, three-phase energy for motor circuits, the lamp circuits, of course, being single-phase. From the transformer rooms secondaries are run to the street and arcade lighting systems. Four circuits issue from each transformer room—a three-phase system for motors, a twenty-four-hour lighting system, street-lighting system and arcade-lighting system. The last two are switched on at dusk and are switched off again when the grounds are closed.

PANAMA-CALIFORNIA EXPOSITION AT SAN DIEGO ON OPENING NIGHT

The Best Control of Public Utilities Through Class Rates

Mr. Frank G. Baum, of San Francisco, presented a paper on "The Best Control of Public Utilities" before the San Francisco Section of the American Institute of Electrical Engineers on Jan. 22.

The paper is especially timely because the people of California have adopted an amendment to the constitution placing public utilities throughout the State under the jurisdiction of the Railroad Commission.

It must be evident to anyone who has given serious consideration to the subject of the control of public utilities, Mr. Baum said, that it is necessary always to have in mind the following as an axiom: The best control of a utility is that which develops an eagerness and ability on the part of the company to furnish the service and an equal eagerness and ability on the part of the consumer to purchase the service.

How are we to determine the best way in which to develop this eagerness and ability on the part of the company and the consumer? In answer, Mr. Baum said:

(1) There must be developed a diversified use of electric energy. (2) Fair public service commissions must act as boards of arbitration between the company and the consumer. (3) The rate of return on the investment must be liberal. (4) There must be confidence in the company and its rates, and class rates are absolutely necessary for the development of the business. (5) There must be some incentive for the company to make economies in construction and operation.

All the early companies risked large sums in the early stages of the electrical business, Mr. Baum said, and this should not be lost sight of in fixing rates at the present time. A certain manufacturing company at one time had a possible loss of about $10,000,000 facing it before it made its type of steam turbine a success. The price at which turbines are sold must, of course, absorb this amount, but the gain in efficiency obtainable, of which the public gets the benefit, makes the $10,000,000 insignificant. If the manufacturers are entitled to something for their risk, is not the electricity supply company that installed reciprocating engines to be replaced by turbines entitled to something for its risk? Usually we penalize the company and make it stand the loss on its books. Another manufacturing company stood to lose at one time about $500,000 before the induction motor was made a success. It is certainly entitled to a large return for this risk, especially when we consider the enormous value of the induction motor to the world. Similarly the early transmission companies stood to lose the entire first investment made. And yet, in spite of the enormous value of this pioneer work, many people say there shall be a return on only the wise investment. Who is to judge what was a wise investment in water-power twenty years ago?

The lighting consumer's rate is much higher than the rate to the power consumer because: (1) The investment and cost of operation to serve the lighting con-

sumer are greater than the investment and cost of operation to serve the power consumer, and (2), much more important, the total energy consumed by the power consumers is much greater than that used by the lighting consumers for the same peak demanded.

It is believed, Mr. Baum said in conclusion, that the success of the electric-power business depends upon developing a diversified load. To obtain a diversified load it is necessary to have "class rates" in order that the power business may be developed parallel with the lighting business. Class rates, as determined by the method described in the paper, it is believed, are equitable to all consumers and will result in the lowest rates to all consumers as business is developed.

The eagerness and ability which it is desirable to create on the part of the public utility company and the consumer, then, primarily depend upon two things: (1) Liberal rates of return on investment so that the companies will make extensions and economies. (2) Class rates determined by the method outlined, applied to develop all the possibilities of the business.

Uniform class rates are necessary to build up a diversified business, to give the lowest stable rates to all consumers and to form an incentive to the companies to reduce financing, construction and operation costs. It is believed that the application of the above will result in an "eagerness and ability on the part of the company to furnish the service and an equal eagerness and ability on the part of the consumer to purchase the service," and it is confidently believed that this will result "to the best interest of the business," considering the company, the consumer and the community as a whole. If it does that, as it is confidently believed it will, there will result "the best control of public utilities."

Mr. Gruhl on Increased Taxation in Wisconsin

A paper on "Increased Taxation in Wisconsin and its Effect Upon Public Service Companies" was presented before the annual convention of the Wisconsin Electrical Association at Milwaukee on Jan. 21 by Mr. Edwin Gruhl, assistant to the president of the Watertown (Wis.) Gas & Electric Company. Mr. Gruhl said that the increases in taxes of public service corporations during the last few years have been proportionately greater than the general increase in taxes. The increases have, moreover, far exceeded the rate of growth of the business whether measured in terms of new capital or in terms of gross or net earnings.

The summarized reports of the several utilities to the Railroad Commission show that during the period 1910 to 1914 taxes paid by gas utilities increased 44.72 per cent as compared with an increase in operating revenues of 24.79 per cent and an increase in gross income before deducting taxes of 14.97 per cent. Where in 1910 gas companies paid 6.07 per cent of their operating revenues in taxes this ratio has increased steadily to 7.04 per cent of their operating revenues for the fiscal year 1914. The percentage of taxes to gross income before deducting taxes shows a similar increase from 21.26 per cent to 26.76 per cent. An examination of the returns of all electric utilities to the Railroad Commission discloses the same tendency to increase, Mr. Gruhl added. Where during this five year period operating revenues increased 80.33 per cent and gross income before deducting taxes increased 35.83 per cent, taxes paid increased 112.74 per cent. Where electric utilities in 1910 paid 4.45 per cent of their operating revenues as taxes this ratio increased to 5.25 per cent in 1914, while the proportion of gross income available for taxes and return upon the investment which has been paid in taxes increased from 10.17 per cent to 15.92 per cent. Electric railway operating revenues during the five years increased 19.30 per cent, and gross income available for taxes and return upon the investment decreased 10.37 per cent, while taxes continued to increase 15.82 per cent.

Mr. Gruhl declared that much of the reason for increased assessment of public service corporations rests on the theory that the intangible values of such corporations are peculiar in themselves and are entitled to special classifications and special treatment. These intangibles are frequently referred to in statutes as "rights," "privileges," "franchises" or "corporate excess." Before the advent of commission regulation there was greater reason why unregulated monopolies should be taxed in excess of the amounts contributed by competitive businesses or other classes of property, but such taxes are not levied upon the theory that they were a proper and fair contribution of the corporation to the conduct of government but as a compulsory form of profit-sharing.

While these general descriptive titles may have had their use in the past as a justification for placing larger tax burdens upon public service corporations, the conditions justifying their use have largely disappeared, continued Mr. Gruhl. Under regulation both the commission and the public are demanding that service should be furnished at cost to the utility plus a fair return upon the investment, and in Wisconsin more than in any other state the element of cost has been the controlling factor in the regulation of rates of service. Special taxes, whether in the form of large assessed valuations attributed to franchises or as other public burdens, merely increase the cost and are ultimately shifted upon the customer. It is a mistaken notion, prevalent in many quarters, that this is merely taking money from one pocket to put it in another.

Were even a part of the $1,315,000 contributed by gas companies in taxes last year, the $2,642,000 contributed by electric companies and the $2,412,000 contributed by traction companies applied to finance additional miles of gas mains, electric lines and new tracks, Mr. Gruhl suggested, there would be less of criticism that there has been no expansion of the utility business in Wisconsin. Considering that taxes paid in 1914 amount on an average to 7 cents of the cost of gas per 1000 cu. ft. to one-half a cent on the cost of electrical energy, to $4 on the annual cost of an arc lamp, and to nearly one-half a cent on the cost of carrying a passenger, it is very apparent that the imposition of such indirect taxes has a far-reaching effect upon the average customer's use of the service.

Mr. Gruhl said that there has been much discussion of the reasons why valuations for purposes of taxation should be different from valuation for purposes of rate-making. Years ago, when a joint engineering staff was established to serve both the Tax and the Railroad Commissions, publicists in other states applauded the unusual sagacity of such a plan. It is probable that no one then believed that the valuations for taxation would largely exceed the values for rate-making purposes. The reason for these differences lies in the special treatment accorded franchises. Franchises apparently have value for purposes of taxation and no value for purposes of rate-making. It seems clear that there should be no conflict in the State's policy with respect to franchise values in its administration of regulation and taxation laws, particularly where the results to be achieved by these laws are in conflict. Nor is it necessary to point out the moral of the Consolidated Gas, the Baltimore Electric and the recent Passaic Gas cases to illustrate that tax values and franchise values as fixed by the State sometimes intrude themselves in rate cases despite a definite State policy to disregard such values.

Miscellaneous News Notes

Power Company to Buy Municipal Plant.—The village of Fremont, Mich., has voted to sell its electric-lighting plant to the Grand Rapids-Muskegon Power Company for $13,000, at the same time giving the company a thirty-year franchise. The plant, which has been in operation for eighteen years, was badly in need of repairs.

One Bill for Gas and Electricity.—The New Orleans (La.) Railway & Light Company, beginning with the first of the year, inaugurated a system whereby customers using both gas and electricity had both meters read at the same time and one bill presented for both. In this way the unnecessary annoyance of paying two bills to one company at different times will be avoided.

Objection to Licensing Contractors in Cincinnati.—It is said that more than 500 firms and civic organizations have entered signed protests against the enactment of the proposed ordinance requiring that electrical contractors at Cincinnati, Ohio, must be licensed. A public hearing will be held before the Council committee to which the ordinance was referred. Opponents of the measure claim that property is safeguarded against defective electrical work by the inspections of the Cincinnati Inspection Bureau and other underwriters' organizations.

Rats Gnawed Copper Wire, Opening Circuit.—Electricians investigating an open circuit in the wiring of a Chicago hotel found that the insulation and the No. 12 copper wire had been eaten away by rats. The hotel was an old structure which had been wired without conduit, and in the passageway in which the open circuit occurred the wire was incased in loom. Marks of rats' teeth were plainly visible along the few inches of copper which had been bared, and the break finally occurred near the center of the bare wire where the gnawing had been most frequent.

Where They Grow the Poles to Fit the Circuits.—A telephone company operating in the country south of Arkansas City, Kan., has a unique line on the road which marks the division between Arkansas and Oklahoma. The line, consisting of one full-metallic circuit, is supported on poles which, forking at the top, afford two well-separated prongs on which small glass insulators are screwed. No brackets are therefore needed. Noting this unusual construction while on a convention automobile tour, a number of members of the Kansas Gas, Water, Electric Light & Street Railway Association voted it to be the cheapest as well as the most inexpensive type of construction they had ever seen.

Variable-Speed Constant Current Battery-Charging System.—A patent issued on Dec. 29, 1914, to Mr. H. Ward Leonard, Bronxville, N. Y., relates to a motor-vehicle battery-charging system by means of which the current is kept at a constant average valve throughout a wide range of speed of the charging generator. When the current in the work circuit reaches a certain maximum, the voltage is reduced automatically until the current reaches a certain minimum, whereupon the voltage is again increased until the maximum condition is reached, the cycle being rejected in such a manner as to maintain a substantially constant average current in the total work circuit. Use is made of an electromagnetic switch which serves to limit the speed of the generator to a proper amount irrespective of the speed of the vehicle and to limit the current to an amount within the range of the battery.

Unsuccessful Damage Suit Against Electric-Service Company.—An electric-service company is not responsible for electrical fires caused by defects in its consumers' wiring according to a decision rendered by the Northumberland County (Pa.) Court of Common Pleas in a suit brought against the Northumberland County Gas & Electric Company. The necessity of sharply defining where a central-station company's service and responsibility end was emphasized. Cross-examination indicated that the suit was really brought by the insurance companies and was entered about a year after the fire occurred, when all evidences of the cause were removed except for photographs taken by the insurance company. Owing to the evidence produced Judge H. W. Cummings decided that the central-station company had no responsibility for construction beyond the point where the consumer's equipment was connected to the wires supplying energy.

Associations and Societies

Northern White Cedar Association.—As already noted in these columns, the annual meeting of the Northern White Cedar Association will be held at Minneapolis, Jan. 26 and 27. Mr. N. E. Boucher, 743 Lumber Exchange, Minneapolis, is secretary.

New York Jovians.—At the midday meeting of the Jovians of New York City on Jan. 20 an address was delivered by Dr. M. I. Pupin, professor of electromechanics at Columbia University, on "Servia and the Present European Conflict."

Milwaukee Efficiency Society.—At a meeting of the Milwaukee Efficiency Society, Jan. 14, Mr. Charles L. Benjamin, former advertising manager of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., spoke on the subject of "Advertising as an Aid to Business Efficiency."

Chicago Section, I. E. S.—Dr. Clayton H. Sharp, technical director of the Electrical Testing Laboratories, New York City, will address the Chicago Section of the Illuminating Engineering Society, Jan. 29, in the rooms of the Western Society of Engineers, Monadnock Block, Chicago.

Annual Meeting of Iowa Section, N. E. L. A.—The annual meeting of the Iowa Section of the National Electric Light Association will be held at Keokuk, April 20, 21 and 22. Mr. Rex H. Fowler, Des Moines Electric Company, Des Moines. Ia., is assistant secretary of the section.

St. Louis N. E. L. A. Bulletin Now "Wire and Pipe."—With the January, 1915, issue the monthly publication of the employees of the Union Electric Light & Power Company, St. Louis, Mo., the St. Louis County Gas Company and the Electric Company of Missouri, formerly the *Union Electric Bulletin*, takes its new name, *Wire and Pipe*. A prize of $3 was awarded to Mr. E. F. Stevens, who suggested this title.

Special to Western Inspectors' Convention.—A special car for members of the Western Association of Electrical Inspectors will leave Chicago over the Chicago, Milwaukee & St. Paul Railroad Monday, Jan. 25, at 6.35 p. m., reaching Minneapolis, Minn., next morning in time for the opening of the association's annual convention, which will be held at the Hotel Radisson, Jan. 26, 27 and 28. The program and arrangements for the convention were referred to fully on page 133 of our issue of Jan. 9.

Chicago Section, E. V. A.—Mr. E. B. Forslund, of the Northwestern Electric Company, Chicago, described a rotary converter for vehicle charging before the Jan. 12 meeting of the Chicago Section of the Electric Vehicle Association. At the Jan. 19 meeting Mr. George A. Arnold, of the Lincoln Electric Company, Cleveland, Ohio, abstracted a paper read by Mr. J. F. Lincoln at the recent Philadelphia convention. The Chicago Section holds weekly luncheon meetings at the Railroad Club, Karpen Building, 900 South Michigan Avenue.

"Rules of the Road" for Electric-Vehicle Drivers.—The Chicago Section of the Electric Vehicle Association is preparing to send to all users of electric passenger cars in that city a pamphlet abstracting the more common traffic rules formulated by the police department. Suggestions will also be offered for the proper operation of electric vehicles, and particular emphasis is to be laid on the point that slow-moving vehicles should keep to the side of the roadway, surrendering the crown of the pavement to faster traffic. Mr. D. C. Arlington has the preparation of the booklet in charge.

Six Hundred at Annual Meeting of Chicago Electric Club.—Six hundred members and guests of the Electric Club of Chicago filled to overflowing the great banquet hall of the Hotel LaSalle in that city on Thursday evening, Jan. 7, for the club's annual meeting, which followed a light supper. Brief addresses and reports were made by the officers of the retiring administration—Mr. A. R. Bone, president; Mr. W. C. Berry, vice-president; Mr. F. W. Harvey, treasurer, and Mr. H. Ehrlich, secretary. President Bone was presented with a monster watch-fob in recognition of the growth of the club's membership during his term. The incoming officers, headed by the new president, Mr. W. R. Pinckard, were then installed.

Meeting of Chamber of Commerce of United States.—The annual meeting of the Chamber of Commerce of the United States will be held in Washington on Feb. 3 to 5. President Wilson will make an address at the dinner on the evening of Feb. 4. Three members of the Cabinet will be heard at different sessions, Secretaries Bryan, McAdoo and Redfield. Governor Charles H. Hamlin of the Federal Reserve Board will discuss the federal reserve bank law, and Commissioner of Corporations Joseph E. Davies the federal trade commission law. Dr. Edward E. Pratt, chief of the Bureau of Foreign and Domestic Commerce, and Mr. Samuel McRoberts, vice-president of the National City Bank of New York, will be among the other speakers at the meeting.

Joint Meeting of New York Section of I. E. S. and Professional Photographers.—The application of electric lamps to photography was discussed by a number of speakers on Jan. 14 in New York City, at the joint meeting of the New York Section of the Illuminating Engineering Society and the Metropolitan Section of the Professional Photographers' Society of New York. Among those who spoke were Mr. M. Luckiesh on "The Application of the New High-Efficiency Tungsten Lamp to Photography," Mr. J. E. Williamson on "Submarine Photography," Mr. J. B. Taylor on "Color Photography," and Mr. M. B. Buckman on "Application of Mercury-Vapor Lamps to Photography." Following the presentation of these subjects, photographs were taken under the light furnished by the electric lamps which were exhibited to show their relative merits.

Annual Meeting of Mining Engineers.—The American Institute of Mining Engineers will hold its next annual meeting in New York from Feb. 15 to 17. On Wednesday, Feb. 17, there will be a technical session devoted to electricity in mines, at which the following papers will be presented: "Hydro-electric Development of the Peninsular Power Company," by Mr. Charles V. Seastone; "Underground Haulage by Storage-Battery Locomotives in the Bunker Hill and Sullivan Mines," by Mr. J. W. Gwinn; "Testing and Application of Hammer Drills," by Mr. B. F. Tillson; "Mining Methods of the Arizona Copper Company," by Mr. P. B. Scotland; "Mining Methods at Park City, Utah," by Mr. James Humes, and "Some Defects of the United States Mining Law," by Mr. Courtenay DeKalb. Mr. Bradley Stoughton, 29 West Thirty-ninth Street, New York, is secretary of the American Institute of Mining Engineers.

European Boiler-Room Practice.—In a lecture on Jan. 13 before the New York Electrical Society Mr. William A. Blonck spoke on "European Boiler-Room Practice and the Boiler Efficiency Methods in the United States with Reference to Electric Light and Power Plants." He pointed out the features in German generating stations, calling special attention to the large coal-storage space and small overhead bunkers, the unit boiler system, the substitution of economizers for the last passes in boilers to reduce stack temperature, the use of ejector draft producers, and the practice of connecting all auxiliaries to one turbine. The speaker also devoted considerable time to the discussion of methods of indicating or recording boiler performance. The lecture drew out an interesting discussion, in which the following took part: Messrs. C. O. Mailloux, R. J. S. Pigott and Frederick A. Scheffler. An abstract of the lecture and discussion will appear in a later issue of the ELECTRICAL WORLD.

New York Electric Vehicle Association Procures Co-operative Garage.—The often-talked-of plan of a co-operative garage for electric pleasure vehicles has become a reality with the signing of a lease by the New York Electric Vehicle Association for a building on the southwest corner of Central Park West and Sixty-second Street. A number of the leading manufacturers of electric pleasure vehicles are co-operating with the New York Electric Vehicle Association in this undertaking and all concerned are sparing no efforts to make it a big success. The Rauch & Lang, Detroit and Baker companies will have showrooms in the building, making it their headquarters. The various manufacturers will have their showrooms in the building, and these are being rapidly fitted up for occupancy, while the garage itself is being equipped so as to make it in every way an ideal garage for electric cars. The garage will start in with accommodations for 150 cars, of which more than 100 have already been secured. It is planned that there shall be a fixed charge of $45 a month, which will include battery charging, care of the car and taking the car to and from the owner's residence to the garage. The object of the plan is to provide a large, centrally located garage where electric pleasure cars will have a home of their own and receive special care and attention.

A. I. E. E. Activities.—At a meeting of the board of directors of the American Institute of Electrical Engineers on Jan. 8 authority was granted to hold Institute meetings in Cleveland on March 18 and 19 and in Pittsburgh on April 15 and 16. These meetings will be conducted under the auspices of the industrial-power committee with the co-operation of the Cleveland and Pittsburgh sections. Upon the petition of Prof. S. R. Pritchard, of the Virginia Polytechnic Institute, Blacksburg, Va., the organization of a student branch at that institute was authorized. Past-president Gano Dunn was unanimously reappointed one of the American Institute of Electrical Engineers' representatives upon the board of trustees of the United Engineering Society for the term of three years. Secretary Hutchinson announced that, in accordance with Section 21 of the Institute by-laws, President Lincoln would become a member of the John Fritz Medal board of award on the third Friday of January, to succeed Past-president Dugald C. Jackson, whose term will expire on that date. Past-president Ralph D. Mershon was appointed a member of the Edison Medal committee to fill the vacancy caused by the resignation of Mr. W. D. Weaver. Mr. Harry Parker Gibbs was appointed local honorary secretary for India for the term of two years, to succeed Mr. Clare F. Beames, who recently returned to the United States from that country.

Washington Section, E. V. A.—The Washington (D. C.) Section of the Electric Vehicle Association of America met on Jan. 14 at the offices of the Potomac Electric Power Company. Mr. W. H. Haycock, superintendent of mails, Post Office Department, read a paper on the means that have been employed in Washington to transport the mails and their relative merits. The screen wagon is used to handle the mails between the railroad stations and the post office and between the post office and its various substations. Vehicles for this service are of from 1500-lb. to 6000-lb. capacity and should have heavy haulage and mileage capacity rather than speed characteristics. Since the institution of the parcels post a new type of delivery service has been inaugurated. It is necessary to handle such mail by vehicles of from 1000-lb. to 1500-lb. capacity, and such vehicles should have the following characteristics: The operating expenses during stops should be small, the acceleration and deceleration should be large, the speed should be high, and the mechanical construction should be such that the wear and tear incident to frequent stops and starts will be a minimum. For parcel-post service contracts have been let which provide for gasoline-automobile delivery, steam-automobile delivery and horse-and-wagon delivery. The average cost per package to deliver by automobile was 6 cents, and at the expiration of the contract the contractor refused to renew his contract except at a higher rate. The horse-and-wagon service, by contract, cost 2.5 cents per package. In order to save time and to build up the load-factor of the combined city transportation service the Post Office Department prevailed upon Congress to grant an appropriation for fifty-two gasoline machines to be used by the Washington post office for such service as it may deem best. As a result of the government ownership of delivery automobiles the load-factor has been increased to about 80 per cent and the dead mileage has been much reduced. In December, 1914, these automobiles traveled 11,506 miles, with only 620 miles of dead milage. Screen-wagon service, which cost 37.5 cents per mile under contract, costs 13 cents per mile under government ownership of vehicles, and parcels post, which cost 6 cents per package by contract, now costs 3 cents by government-owned machines. At the present time there are 1700 vehicles used in screen-wagon service in the United States, and less than 5 per cent of these are motor vehicles. There are 2485 vehicles in city delivery service, and less than 10 per cent of these are motor vehicles. Of 43,814 vehicles used in rural delivery, only 10 per cent are motor vehicles.

Public Service Commission News

California Commission

The Railroad Commission of California has issued an order suspending its previous decision and calling for a further hearing in the matter of the application of the Coast Valleys Gas & Electric Company to issue $100,000 first mortgage 6 per cent bonds. The new hearing, which will be held before Commissioner Gordon at San Francisco on Jan. 29, has been called for the purpose of determining the relationship of the company to the guarantee on the bonds of the Monterey & Pacific Grove Railway.

Washington Commission

The commission has decided that the water rights held by the Pacific Power & Light Company form an integral part of the physical property, and that they must therefore be included in determining the valuation for rate-making purposes. That part of the property of the Pacific Power & Light Company which is under consideration is worth $4,700,000, says the decision, and on this valuation a hearing will be held in the near future with the object of establishing rates for the eight counties of the State of Washington which form part of the territory served by the company.

Maryland Commission

The commission, in its report to Governor Goldsborough for 1914, shows that there are 203 corporations under its jurisdiction, or one less than in 1913. Of these thirty-six are electric light companies and eighteen are gas and electric light companies. During the year 396 cases were entered with the commission and 307 were closed. Of those entered 169 were placed on the formal docket, 118 on the correspondence docket and 109 on the short-notice and reparation docket. One of the most useful phases of the work of the commission appears to have been the correspondence docket. Cases involving minor complaints as to rates or service are placed upon this docket and are made the subject of correspondence between the commission and the complainant and the utility against which the complaint was directed. In most cases it has been found practicable to bring about settlement without serious loss of time or inconvenience either to the person complaining or the utility affected.

Reference is made to the conference on gas standards, and it is stated that the commission's efforts are to bring about a settlement of the question of gas standards in the city and the counties upon such a basis as will produce the most permanent and scientific results and will be fair to both companies and consumers.

New York Commissions

The present plan of the Republican party and Governor Whitman is to investigate the public service commissions and conclude the inquiry by Feb. 15. A resolution was introduced in the State Senate on Jan. 18 by Senator Elon R. Brown, leader of the majority, providing for the appointment of a joint legislative investigating committee of four senators and five assemblymen. Senator George F. Thompson of Niagara County, chairman of the new public service committee created in the Senate, will be the chairman of the investigating committee. The bill was introduced at the request of Governor Whitman. The committee will investigate charges that have been made against the commissions and consider recommendations as to reorganization.

The First District Commission, in its anual report to the Legislature for the year ended Dec. 31, 1914, says that its running expenses amounted to practically $3,000,000. Of this amount $2,500,000 was chargeable to rapid transit. The remainder, about $500,000, was incurred in connection with regulation.

The total number of employees at the end of the year was 2100. Of these 1800 are engaged exclusively on rapid transit work, the remainder, 300, in regulation work. This represents an increase in two years' time of approximately 1400 employees, and during this period the commission has awarded about $80,000,000 worth of additional rapid-transit construction contracts.

During 1913 the gas companies sold $34,835,210 worth of gas to the public, or $6.70 per capita. For electrical energy $32,897,659, or $6.32 per capita, was paid. This makes a total of $161,886,544, or $30.45 per capita, for transportation, gas and electric service.

Gas meters tested upon complaint numbered 2880 for the year, and of these 1064, or 36.9 per cent, were more than 2 per cent fast, and 383, or 13.3 per cent, more than 2 per cent slow. Of the 701 electric meters tested, twenty-four, or less than 4 per cent, were found more than 4 per cent fast.

The Second District Commission has decided that it cannot prevent the Mohawk Gas Company from shutting off the supply of Mr. C. Martin, of Schenectady, if he continues to refuse to pay a bill for gas used in excess of that paid for in a 25-cent prepayment meter. Commissioner Van Santvoord writes an opinion, concurred in by Commissioner Emmet, in which it is held that the commission is without power to make the order asked by Mr. Martin. Commissioner Decker's opinion holds that the commission has this power, but that the company has a right to shut off the gas if the bill is not paid. Commissioner Irvine, in an opinion concurred in by Commissioner Hodson, holds that the commission has the power to prevent the company from shutting off the gas and that such an order should be made. Thus three commissioners agree that no order should be issued; for, though three commissioners hold that the commission can issue such an order, only two think this should be done.

The Second District commission in presenting its report to the Legislature for the year 1914 says it "expressly refrains from any academic discussion of the value to the State of such a regulative body, under the conviction that its most useful contribution to such a discussion will be found in a simple recital of its work during the past year."

The record of cases handled indicates that 298 entire days of the calendar year were devoted to hearings, 630 in number, in Albany, Buffalo, New York and throughout the State. Notwithstanding that during every day of the ordinary business year the commission or one of its members was thus holding public sessions, 2195 formal and informal cases were settled between March 16, 1914, the date the present personnel of the commission was organized, and the first of the year.

During the latter period 1756 new cases were filed with the commission—slightly more than the usual number for a like period in other years. The accumulation of cases that piled up previous to March 16, 1914, when the membership of the commission was reduced by unfilled vacancies, has been wiped out, and the calendars are now free of all but strictly current business. On March 16 there were 390 formal and 558 informal cases pending. On Jan. 1, 1915, there were but 182 formal cases and 327 informal cases, all in active process of settlement.

Notwithstanding many additional functions imposed on the commission by the Legislature since 1908, such as the regulation of telephones and telegraphs, baggage transfer and autobus lines and the growth of business in other fields, the expenses have increased but 44 per cent, which, with one exception, is a smaller increase than that of any other department. These figures do not include appropriations for grade-crossing elimination, which form the subject of special recommendations in the report, nor the $100,000 appropriated last year for the inventory and appraisal of the New York Telephone Company's property in New York City; $92,000 of this special appropriation remains unexpended.

Important changes in the Public Service Commissions law are recommended. These include the extension of the authority to suspend proposed rates, pending determination of their reasonableness, to the rates of telephone, telegraph, gas, electric and all corporations subject to rate regulation.

It is recommended that the sale or transfer of telephone or telegraph properties and the acquisition of stock or bonds in one telephone or telegraph company by another be made subject to the approval of the commission as are like transactions of other public service corporations, and that all telephone companies in the public service be subjected to regulation under the statute.

The appropriation asked for this year is $423,685.

Personal

Mr. Charles A. Gilham, formerly manager of the Central Indiana Light, Heat & Power Company of Bloomington, Ind., has been recently made vice-president of the New York Steam Company.

Mr. H. F. Cameron, of the Westinghouse Lamp Company's New York office, has been appointed executive in charge of the Lake Charles (La.) Railway, Light & Waterworks Company.

Mr. J. Guinney, of Los Angeles, has been appointed manager, contract agent and superintendent of the Gallup (N. M.) Electric Light Company as successor to Mr. Louis S. Frith, resigned.

Mr. Sanford J. McAgee, manager of the Ithaca (N. Y.) Electric Light & Power Company and of the Ithaca Gas Light Company, has been appointed manager of the Beaver County Electric Light Company at New Brighton, Pa.

Mr. L. A. Osborne, vice-president of the Westinghouse Electric & Manufacturing Company, sails for England from New York to-day. The trip is for business purposes, and Mr. Osborne will be away from New York for several weeks.

Mr. W. L. Davis, formerly connected with the Texas Traction Company and Southern Traction Company of Dallas, Tex., as auditor, has resigned his connections with these companies to enter the public accounting field in Cincinnati, beginning about Feb. 1.

Mr. Carl J. Fechheimer, who for nearly five years had charge of the design of alternating-current machinery of the Crocker-Wheeler Company, resigned from that position on Nov. 30 of last year in order to accept a position in the power division of the engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa.

Mr. A. T. MacDonald, former sales manager of the old Louisville Lighting Company, Louisville, Ky., has been appointed general manager of the local agency of the Commonwealth Life Insurance Company. Mr. MacDonald, who edited the Louisville company's attractive publication, *Chained Lightning*, will also assume charge of a publicity campaign for the Commonwealth company. He recently served as secretary of the Louisville Commercial Club.

Mr. Fred Hanemann, vice-president of the Commercial Electric Company of New Orleans, La., and one of the progressive members of the Louisiana branch of the National Electrical Contractors' Association, was elected a director of the national body at a general meeting held Jan. 6. Mr. Hanemann has been identified with the electrical construction business for many years, and he was among those who formed the State branch of the national body.

Sir Herbert S. Holt, of Montreal, Quebec, who was recently honored with a knighthood, is one of the power and transportation giants of the Dominion. Herbert Holt went to Canada in 1875 as a nineteen-year-old immigrant from Ireland. He had had a training in mathematics and engineering at Trinity College, Dublin, and a job was given to him on the Victoria Railway by James Ross, of Montreal. The road was a crude lumbering line extending north from Lindsay into the forests of Haliburton. When Mr. Ross moved to Toronto as superintendent of the Credit Valley Railway, later absorbed by the Canadian Pacific Railway, Herbert Holt went with him. In 1883 Mr. Ross went West as superintendent of construction on the prairie division of the Canadian Pacific Railway, and again he took young Holt with him. About the same time William MacKenzie and D. D. Mann went West, and young Holt soon saw that there was more money in the contracting business than in working on salary as an engineer. He spent seven years in that business, being all the time more or less in touch with MacKenzie, Mann and Ross. Returning to Montreal, he directed his energy to getting control of the city's power and light facilities. He first bought out the old Montreal Gas Company, then he acquired the Royal Electric Company, and by degrees buying out competing companies he evolved the present Montreal Light, Heat & Power Company, with its $17,000,000 capital and its almost absolute monopoly in the city and districts of Montreal. Besides being president of the Montreal Light, Heat & Power Company, Sir Herbert S. Holt is president of the Royal Bank and a director of the Canadian Pacific Railway.

Mr. William B. Jackson, consulting engineer, Chicago, who has been elected president of the Western Society of Engineers, is one of three brothers well known among electrical engineers, the other two being Prof. Dugald C. Jackson, head of the electrical engineering department of the Massachusetts Institute of Technology, Boston, and Prof. John Price Jackson, dean of the school of engineering, Pennsylvania State College, and commissioner of labor and industry for the State of Pennsylvania. William Benjamin Jackson was born June 22, 1870, at Kennett Square, Pa., and was graduated in 1890 from "Penn State," where his father was professor of mathematics. During the three years following graduation he engaged in the banking business at Colorado Springs, Col. In 1893 he took charge of the Pennsylvania mining exhibit at the Chicago World's Fair, and the next year he joined the staff of the United Electric Light & Power Company, New York City. In 1895 he received the degree of M. E. from his alma mater, and shortly afterward he became engineer in charge of the specification department of the Stanley Electric Manufacturing Company. Later he entered the central-station field as manager of a water-power plant transmitting energy to Grand Rapids, Mich., the first high-tension transmission system to be started east of the Rocky Mountains. While in this position he devised a readiness-to-serve system of rates for electric service. In 1898 he assumed the duties of superintendent and chief engineer of the New York & Staten Island Electric Company, and in 1899 he was appointed general superintendent of the Colorado Electric Power Company. Rejoining the Stanley organization in 1901, Mr. Jackson, among other work, laid out in detail the electrical equipment of the 20,000-hp York Haven (Pa.) plant of the Susquehanna River and also carried out engineering work in Austria and Hungary. In 1902, with his brother, Mr. Dugald C. Jackson, he organized the consulting engineering firm of D. C. & W. B. Jackson, with offices at Madison, Wis. In 1907 the main office was opened in Chicago, and later another office was opened in Boston. To the work of this firm Mr. W. B. Jackson has since devoted all his time. He is a director of the Cutler-Hammer Clutch Company, Milwaukee, and is a member of both the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. He holds memberships in the American Society of Civil Engineers, the American Gas Institute, the National Electric Light Association, the American Electric Railway Association and other engineering organizations, and is a member of the Union League, Engineers', City, Midday, Press and Flossmoor clubs, Chicago; the Milwaukee and University clubs, Milwaukee, and the Engineers' Club of Boston.

W. B. JACKSON

Obituary

H. Howard Stannard, for many years connected with Mr. G. M. Gest, underground-circuit contractor of New York, died at his home in Jersey City, Dec. 24, of pneumonia. Mr. Stannard was born in Oak Hill, Greene County, N. Y., forty-eight years ago, and his early life was spent in that town and in Albany. His business career started with the Weyant Brick Company of that city. Afterward he was with Norcross Brothers of Boston. He was connected with Mr. G. M. Gest for the past ten years and acted in various capacities during that period, being at the time of his death commercial engineer. Mr. Stannard was a man of wide acquaintance, knowing men in every phase of the electrical field, for in his travels around the United States and Canada, and at the conventions, few of which he missed, he was continually adding to his circle of acquaintances. He was a man possessing admirable business qualities as well as of a genial personality which, linked with his wide acquaintanceship, made him a host of friends. He leaves a wife and two children.

Corporate and Financial

Jersey Electric Stock Issue Approved.—The New Jersey Board of Public Utility Commissioners has approved the issue of $30,000 capital stock by the Jersey Electric Company.

Ohio Service Company Note Issue.—Brooks & Company, Scranton, Pa., are offering $667,000 three-year 6 per cent convertible gold notes of the Ohio Service Company, dated Nov. 1, 1914.

Byllesby Company Offering.—H. M. Byllesby & Company have issued a small booklet describing the securities of the Byllesby properties. The latest earnings of these companies are included in the booklet.

Cost of Additions to Henderson Plant.—The cost of additions to the electric light plant of Henderson, Ky., from June 1, 1913, up to and including Dec. 15, 1914, amounted to $66,281. Of this $45,852 was spent in 1913, and $20,429 in 1914.

San Joaquin Light & Power to Issue Bonds.—The San Joaquin Light & Power Corporation, Fresno, Cal., has been authorized by the California Railroad Commission to issue by June 30, 1915, $150,000 of series B first and refunding mortgage forty-year 5 per cent bonds.

Portsmouth Street Railroad & Light Company's Bonds Sold.—John Nickerson, Jr., of New York, announces that he has sold the entire issue of 6 per cent first mortgage gold bonds of the Portsmouth (Ohio) Street Railroad & Light Company. Of these bonds $500,000 were sold to Baker, Ayling & Company, of Boston.

Western Union Earnings Report.—The earnings report for the Western Union Telegraph Company for the year ended Dec. 31, 1914, December estimated, shows a total income of $47,051,417; expenses, $40,552,745, and interest on bonded debt, $1,337,250, thus leaving a net income of $5,161,422, which compares with a net income of $3,167,099 for the year ended Dec. 31, 1913.

Westfield Power Reduced Dividend.—The Westfield (Mass.) Power Company has declared its semi-annual dividend of 2½ per cent, thus making a total for the year of 5 per cent as against the customary 6 per cent. One reason for reducing dividends was that the increased valuation of property increased the tax rate, materially reducing the income of the company.

York Railway Scrip Dividend.—The York (Pa.) Railways declared a scrip dividend of 2½ per cent on the preferred stock for the six months ended Nov. 30, 1914, payable on Jan. 30. The scrip will be dated Jan. 30, 1915, and run for three years with 5 per cent interest. With the exception of one-half share the company owns all the stock of the Edison Light & Power Company, York, Pa.

Detroit Edison Debentures Subscribed. — The $2,645,000 issue of 6 per cent convertible debenture bonds of the Detroit (Mich.) Edison Company offered to the stockholders on Dec. 10 has been taken up. At the office of the North American Company, the controlling company, it was stated that the outlook for the year 1915, on a basis of the January operations up to date, is very encouraging. Business for the year 1915 promises to be far ahead of that for 1914.

Growth of Consumers' Power Company of Minnesota.—The growth of the Consumers' Power Company of Minnesota is indicated by the following connected load statistics as of Oct. 31: Electric customers, 55,106 in 1914, 45,982 in 1913; incandescent lamps (16-cp equivalent), 1,119,335 in 1914, 972,420 in 1913; municipal arc lamps, 3660 in 1914, 3289 in 1913; horse-power in stationary motors, 71,937 in 1914, 62,730 in 1913; total connected load, 129,000 kw in 1914, 109,056 kw in 1913.

Dayton Power & Light Progress.—During 1914 the Dayton (Ohio) Power & Light Company made arrangements to supply seven municipalities near Dayton. The towns of Osborne, Carlisle, Cedarville, Clifton and Yellow Springs were placed on the company's lines, and the towns of Fairfield and Bowersville will be supplied with energy in the spring. In both Osborne and Carlisle street-lighting contracts were secured, the company having purchased the municipal plant in the former place.

Coast Valley Gas & Electric Subsidiary Defaults Interest.—The Monterey & Pacific Grove Railway, Monterey, Cal., has defaulted interest due Jan. 1, 1915, on its first mortgage 6 per cent bonds. The company is controlled by the Coast Valleys Gas & Electric Company, San Francisco, which is controlled by the California Railway & Power Company, a subsidiary of the United Railways Investment Company. Of the $300,000 of bonds issued, $18,000 are in the sinking fund, $12,000 are in the treasury of the company, $72,000 are held by the Coast Valleys Gas & Electric Company, and $198,000 are owned by the public.

United Light and Railways Note Issue.—N. W. Halsey & Company of New York are offering $1,500,000 of the United Light & Railways Company (Grand Rapids, Mich.) 6 per cent gold coupon notes, dated Jan. 1, 1915, and due Jan. 1, 1918, and Jan. 1, 1920. The proceeds from the sale of these notes are to be used to complete payment on properties heretofore acquired and to reimburse the treasury of the company for the cost of improvements to subsidiary properties. The notes will be secured by $3,000,000 first refunding 5 per cent bonds of the United Light & Railways Company. Net earnings for the year ended Nov. 30, 1914, were $2,352,660.

Pacific Gas & Electric Sells Bonds Subject to Commission Approval.—The Pacific Gas & Electric Company has filed an application with the Railroad Commission of California requesting authority to issue $4,000,000 of 5 per cent one-year gold notes to be dated Dec. 15, 1914, and to be used in refunding $4,000,000 of its 5 per cent one-year gold notes dated March 25, 1914. The company purposes to issue these notes at not less than 98 and to pledge as security for their payment $5,000,000 of its convertible general lien bonds and $5,000,000 of its general and refunding mortgage gold bonds. The notes have been sold to New York bankers subject to the approval of the commission.

Eastern Pennsylvania Power Redeems Coupons.—It was stated at the New York office of Lee, Higginson & Company that the Eastern Pennsylvania Power Company, Easton, Pa., had redeemed the coupons on the first and refunding 5 per cent bonds which the bankers had purchased. According to a statement of the bankers at the time of purchase, they redeemed the Oct. 1 coupons on the outstanding $1,880,000 bonds in order that the bondholders might suffer no inconvenience at that time, and the company's action in deferring the coupon payment at that time was due to the existing financial stringency and the consequences attendant thereon. The company has also since made the required sinking-fund payment.

Columbus Companies to Merge.—At a special meeting of the stockholders of the Columbus (Ohio) Light, Heat & Power Company it was voted unanimously to sell the property of the company to the Columbus Railway, Power & Light Company, according to the plan described in the ELECTRICAL WORLD Dec. 1, 1914. This action assures the consolidation of all commercial light, power and railway properties in Columbus. The railway property is operating the light, heat and power property under a fifty-year lease dated September, 1908. The Columbus Light, Heat & Power Company has outstanding $715,300 stock and $750,000 bonds. About a year ago the merger of the Columbus Edison Company with the Columbus Railway, Power & Light Company took place.

Opinion on Bond Prices.—Mr. John Moody, president of Moody's Investment Service of New York, in his review for 1914 and forecast for 1915, says in regard to the effect of the war on bond prices: "War, destruction and impoverishment in Europe will so decrease the purchasing power of the world's population as to lower the per capita consumption of goods and commodities. This will force commodity prices downward. Falling prices for goods mean increased purchasing power for bond incomes, and therefore bond values will tend to rise. This very decrease in per capita consumption will shortly reduce all demand for new capital and thus cause rates to fall. With money cheap it pays better to buy bonds than to loan money, and this buying will tend to maintain and raise bond prices."

United Light & Power Reorganization.—The reorganization plans of the United Light & Power Company of San Francisco, Cal., when completed, will place the company in the control of the Great Western Power Company, the operating subsidiary of the Western Power Company. Under the plan a new company will be formed to which will be transferred all the properties of the United Light & Power Company of New Jersey, consisting of the United Light & Power Company of California, the Consumers' Light & Power Company, the Central Oakland Light & Power Company, the Southside Light & Power Company and the Equitable Light & Power Company. The authorized bond issue of the new company will be $3,000,000, of which $2,350,000 will be issued immediately in payment for the properties of the old company. In addition the new company will assume $100,000 floating debt, making the total obligations $2,450,000. The total obligations of the old companies amounted to $3,598,000, thus making a loss for the creditors under the organization plan of $1,148,000. The United Light & Power Company of California has $3,060,000 of bonds, of which $2,022,000 are deposited to secure $1,618,000 notes of the United Light & Power Company of New Jersey, now in default, thus leaving $1,031,000 in bonds outstanding. The company also has a floating debt of $700,000 and $243,000 of underlying bonds. The plan proposes to take care of the defaulted notes of the United Light & Power Company of New Jersey at 90 by exchanging them for the bonds of the new company. Of the floating debt, $100,000 held by the general public will be assumed and special arrangements made with those outside of the company who are holding bonds, the amount being $1,037,000. The underlying bonds will be taken care of at par. When the $200,000 of floating debt has been assumed, there will be left $651,000 of the new bonds to take care of $1,037,000 bonds and $600,000 floating debt. Under this plan the controlling interests in the old company will lose practically all they had placed in the company, but the loss by the general public will be small. All bonds of the new company are to be guaranteed by the Great Western Power Company, which will hold all the stock under an agreement with the trustees of the new bonds.

Atlantic Gas & Electric to Be Sold.—Committees representing the bondholders and stockholders of the Atlantic Gas & Electric Company of New York, for which a receiver was appointed recently, have approved a plan submitted by W. S. Barstow & Company, Inc., under which the properties of the Atlantic Gas & Electric Company will be taken over by the General Gas & Electric Company of New York. The plan contemplates the purchase by exchange of securities of the properties of the Atlantic Gas & Electric Company, which will go out of existence on completion of the purchase. The Atlantic company's series A bonds will be exchanged for 5 per cent gold bonds of the General Gas & Electric Company, secured by the same collateral or its equivalent that the series B bonds formerly held. The series B bonds of the Atlantic company will be paid off. A 6 per cent five-year secured note issue of the General Gas & Electric Company has been created to retire $650,000 of the old General Gas & Electric 6 per cent notes and to provide for the construction fund for 1915. The unsecured creditors and the preferred stockholders who subscribe in cash for blocks of securities of the General Gas & Electric Company under an alternate plan, for 22½ per cent or 25 per cent of holdings, will receive General Gas & Electric Company convertible preferred stock. The plan also provides that the Atlantic common-stock holders may subscribe for new securities, in which event they will receive 50 per cent of their present holdings in common stock of the General Gas & Electric Company. For further future construction requirements of the consolidated company a comprehensive plan of financing has been prepared. Using examinations and estimates made by Stone & Webster, engineers, Haskins & Sells, public accountants, and engineers and accountants of W. S. Barstow & Company, Inc., the combined companies will show for 1915 earnings of $173,932 applicable to dividends on the convertible preferred stock, which is entitled to 3 per cent in 1915, 4 per cent in 1916, 5 per cent in 1917, 6 per cent in 1918 and thereafter is non-cumulative. These estimates, it is stated by the Barstow company, are borne out by the past year's earnings of the various companies and are thought conservative.

Manufacturing and Industrial

The Esterline Company, Indianapolis, Ind., has appointed Firth & Marshall, 81 New Street, New York, its Eastern representatives. This concern will handle the company's business in New York and the New England States.

Sales Conference.—The Wesco Supply Company, St. Louis, Mo., has just closed its annual sales conference. Salesmen from various districts throughout the country attended and topics of interest to the company were thoroughly discussed.

The National Carbon Company, Cleveland, Ohio, has appointed Mr. W. H. Arkenburgh, formerly publicity manager for the Union Switch & Signal Company, to a position in its sales department, and he will have charge of its railway and signal work in Canadian territory.

Preparing for Fan Season.—Although the Hunter Fan & Motor Company, Fulton, N. Y., has not developed any new types of fans this year, it is actively preparing for the coming season. The above company has a number of agents in this country and foreign countries. The company reports that the prospects for both foreign and domestic business this year are good.

Mr. Arthur J. Cole, recently district manager of the Westinghouse Lamp Company in Chicago, has been appointed vice-president and general sales manager of the McGraw Company, electrical jobbers of Sioux City, Ia., and Omaha, Neb. Mr. Cole prior to his connection with the Westinghouse interests was sales manager of Kohler Brothers, electrical contractors of Chicago. Mr. Cole will make his headquarters in Omaha.

Foreign Concerns Order Wire by Samples.—In connection with orders received by the Safety Insulated Wire & Cable Company, 114 Liberty Street, New York, for material from foreign countries, especially South America republics, instead of specifications outlining the kind of wire desired, samples of wire or cables are often sent. These samples are usually of European manufacture, indicating that the above manufacturer's products are displacing those made by foreign companies.

Wire Manufacturer's Plant Damaged by Fire.—Part of the Trenton plant of the John A. Roebling Sons Company was badly damaged by fire on the night of Jan. 18. That part of the establishment formerly known as the Buckthorn Fence Company's plant and a building in which insulated wire was manufactured was destroyed. The main plant of the company is at Roebling, N. J., so that production, though slightly handicapped, will go on as usual, especially in products used by the electrical industry.

The Brown-Woods Electric Company, Houston, Tex., has moved its showroom from 709 Fannin Street to 709 Travis Street. The floor space has been doubled, and two floors are now utilized, the first floor being devoted to electrical appliances and specialties and the entire second floor to lighting fixtures. The second floor is divided into rooms in which the different types of fixtures are displayed. The above company is optimistic regarding the future and is expecting business to become normal within sixty or ninety days.

Production of Rutile.—According to the United States Geological Survey, rutile, which is used in the manufacture of electrodes for arc lamps, was produced by only one company during 1914. This concern is known as the American Rutile Company, Roseland, Nelson County, Va., and it produced 94 tons of rutile. Rutile-bearing rock is worked in open cuts by the company, and the rutile forms about 5 per cent of the rock worked. Concentrated rutile sells for $50 to $400 a ton, depending on quality, quantity and preparation.

Mr. R. H. Manwaring has been elected vice-president of the Philadelphia Electrical & Manufacturing Company, Philadelphia, Pa. He has been connected with the company for the past ten years and since 1910 has acted as assistant secretary and sales manager. Mr. Manwaring has had a wide experience in the electrical field and is well known throughout the entire country through his activity in the sales end of the business, having spent his first five years with the company covering every state east of the Mississippi River, as well as southern Canada.

Orders for Lighting Plant.—The Barber-Dwinnell Electric & Manufacturing Company, Kansas City, Mo., reports that it has recently received orders for six large 110-volt plants. According to Mr. C. L. Dwinnell, secretary and treasurer, the company is specializing in storage-battery plants for towns up to 500 inhabitants. It manufactures its own storage batteries for use with these plants where they are adopted.

Alloy Company Faring Well.—The Electrical Alloy Company, Morristown, N. J., reports that all of its departments are busy, some of them operating fourteen hours a day. Two additions have been made to the company's plant in the past year, and on account of the continual growth of the business the capacity of the plant and the amount of equipment will again be increased in the near future. The company is looking for a 100 per cent increase in its business during 1915. The demand for its "Calido" wire and ribbon made of nickel and chromium is large, and these articles are supplied to a number of manufacturers for use with electric-heating appliances. The above company has appointed L. L. Fleig & Company, 180 North Dearborn Street, Chicago, Ill., its Western representative.

Fan Motors Perform After Passing Through Severe Fire.—Several hundred fans were stored in a building adjoining the foundry of the Robbins & Myers Company, Springfield, Ohio, which was recently destroyed by fire. The storehouse was also destroyed. After the fire an 8-in. alternating-current desk fan and a 12-in. alternating-current oscillating fan were dug out of the ice and debris and connected to a supply circuit. Both fans were full of ice and the rotors were frozen fast. The enamel was entirely burned off, and the guards and blades were warped and twisted out of shape by the heat. After the energy supply had been turned on sufficiently long to melt the ice on the motors, both fans started up and threw out considerable spray. The motion was somewhat jerky, owing to the twisted and unbalanced condition of the blades, but the motors continued to operate without mishap as long as the current was on. Apparently their operation was not affected by the unusually severe conditions to which they had been subjected.

Large Number of Motors for Printing Industry.—The motors made by the American Rotary Valve Company, Chicago, Ill., are used chiefly in the operation of printing presses, linotype machines and other printing-plant equipment. Some 800 machines are sold yearly alone to the Mergenthaler Linotype Company. To operate the presses of the *New York American*, 60-hp "Jenny" motors manufactured by the above company are utilized. A 7.5-hp motor is employed on each machine for starting purposes. The equipment in the several plants of the above newspaper includes thirteen sextuple presses, six octuple presses and one colored press, and to operate these machines use is made of twenty 60-hp motors and twenty 7.5-hp motors. Motors made by the American Rotary Valve Company are used to print all the Hearst papers throughout the country, and one of its 60-hp motors will also operate a double sextuple colored press, said to be the largest press of its kind in the world, which will be exhibited by W. R. Hearst at the Panama-Pacific Exposition. Other papers using motors made by the American Rotary Valve Company are the following: *Boston Herald, San Francisco Bulletin, Los Angeles Herald, Chicago Evening Post, Indianapolis News, Springfield Republican, Pittsburgh Gazette, Toledo News-Bee, Detroit Free Press, Kansas City Star, Houston Chronicle, San Antonio Express.*

Conference of Western Electric Credit Men.—The credit managers of the Western Electric Company held a six-day conference at the Auditorium Hotel, Chicago, Jan. 4 to 9. Every branch office was represented and the entire week was given over to discussion of credit topics, the interchange of methods and ideas, and the presentation of papers. Addresses were made by Mr. Gerard Swope, vice-president and general sales manager of the company; Mr. W. P. Sidley, vice-president and general counsel; Mr. J. W. Johnston, treasurer, and Messrs. O. D. Street and E. W. Rockafellow, assistant sales managers. Mr. M. A. Curran, general credit manager, New York City, acted as chairman, and papers were read by Messrs. W. E. Rice, New York; W. B. Wallace, Atlanta, Ga.; A. V. Willett, Dallas, Tex.; E. W. Wolfstyn, Cincinnati, Ohio; E. W. Shepard, Cleveland, Ohio; J. J. O'Reilly, Buffalo,N. Y.; L. R. Browne, Philadelphia, Pa.; G. Williamson, New York; W. A. Williford, St. Louis, Mo.; I. D. Warrington, Pittsburgh, Pa.; E. L. Myers, Omaha, Neb.; H. R. Weisiger, Richmond, Va.; E. R. Gilmore, Chicago; J. H. Kelly, Seattle, Wash.; W. H. McNulty, Minneapolis, Minn.; John Bray, San Francisco, Cal.; R. P. Tracy, Boston, Mass.; C. E. Vandel, Kansas City, Mo.; I. E. Stiles, Chicago, and W. F. Gibbs, Los Angeles, Cal. At the luncheon meeting of Tuesday Mr. Frederick P. Vose, secretary Electric Credit Association of Chicago, spoke on "Personality in Business," and at the Thursday luncheon Mr. Edmond D. Hulbert, vice-president Merchants' Loan & Trust Company, Chicago, discussed the federal reserve act. A number of entertainment features occupied the attention of the credit men between sessions. On Monday afternoon there was an inspection trip through the Hawthorne plant of the company. The present conference was the first of the kind ever held by the Western Electric Company's credit men, and so far as is known it is without precedent in any other electrical or industrial organization of similar character.

Exporting Dynamos and Motors to South America.—In a recent discussion of electrical sales experiences in South America with a representative of the ELECTRICAL WORLD, Mr. A. O. Kuehmsted, vice-president and sales manager of the Gregory Electric Company, Chicago, explained that his company issues circulars printed in Spanish and Portuguese and sells in South America by mail only. It advertises in Brazilian, Argentine and Cuban papers devoted to the interests of the engineering industries and expects satisfactory results from this source in the future. In answer to questions Mr. Kuehmsted continued: "It is a good thing for American business men to remember that the export business is a long time in the building. However, once it is established it is a very satisfactory business and the orders come easier. We have encountered a fine spirit of co-operation in government officials at Washington. Many of the government foreign-trade publications are excellent, and anyone contemplating going into the export business should put himself in touch with government authorities. However, one thing needed is a good list of electrical concerns buying apparatus in South American and Central American countries. Any one who will compile such a list will do a real service to the electrical exporters of this country. We have received no complaints from the packing of our machinery for export and we have had no trouble about collections. We consider foreign business very desirable when handled as an adjunct to domestic sales. We think that in years to come we shall do much more of it and that other American electrical concerns will do likewise. We have found in many cases that our prices were about 50 per cent less than those asked by European manufacturers and dealers. It is to be remembered, however, that the price is not the only factor. Quality is essential, and as a rule foreign buyers are willing to pay a fair price for a good article. Speaking generally, the dealers in South American countries get larger profits than prevail in the United States. I am free to say that it is probable that our export business was first started by our advertising in the ELECTRICAL WORLD. Encouraged by our first orders, we have given some attention to the matter of exports and the business has grown slowly. I think that the first step to be taken by the American manufacturer desiring to engage in foreign trade should be to obtain a list of the possible foreign buyers. Information as to credits in foreign countries may very often be obtained through one's local bank, as banking connections are widespread. Furthermore, the banks are waking up. The National City Bank of New York has already opened a bank at Buenos Aires, and has close connections at Rio de Janeiro, Havana and other points so that credit information can often be obtained quickly by communicating with the home bank at New York. Eventually it would seem likely that some sort of a clearing house of American manufacturers engaged in the export trade in the Chicago area will be formed for the exchange of information. As to the making of shipments, I would advise that this be done, at least at first, through custom-house brokers, as these people relieve the shipper of a lot of worry. It is astonishing often to the shipper to discover to what distant points through bills of lading may be obtained."

Manufacturers' Agency Finds Business Improved.—Speaking of the condition of business since Jan. 1, Mr. J. Gleason, vice-president of the Ohio Distributing Company, 220 Lomax Place, Chicago, remarked to a representative of the ELECTRICAL WORLD that the office staff had been so busy with orders recently that lunches had to be brought in in order to save time. Wire, porcelain, armored cables and outlet boxes, he said, have been in such great demand that the entire stock on hand would have been shipped out had not the firm placed prompt telephone orders with its factory connections and insisted on immediate shipments. Mr. Gleason said that the orders were coming, in the main, from electrical jobbers, contractors and central stations.

Opportunities for Electrical Manufacturers in Siberia

Great opportunities for American electrical trade development exist in Siberia to-day, according to Mr. Chester W. Purington, a consulting mining engineer associated with the Lena Goldfields Company, Ltd., of London, England, who is on a short visit to Boston. To a representative of the ELECTRICAL WORLD Mr. Purington said that as a direct result of the European war, the strong position held hitherto by Germany in supplying electrical apparatus to Russia has been overthrown, and there are remarkable possibilities for American manufacturers anxious to extend foreign business and build up a clientele which can be held for many years. The resources of Siberia will bear investigation on the ground by Russian-speaking representatives of the American electrical industry.

In the past Germany had a powerful hold upon the machinery markets of Siberia. Not long ago a generator of American manufacture was purchased to supply energy for the operation of an 8-ft. dredge on a property familiar to Mr. Purington, but almost insuperable difficulties were encountered in getting the machine into the country and in service, until special permission was finally obtained from a prominent German manufacturer of electrical equipment for the use of the apparatus. Germany for a good many years will find it exceedingly difficult to sell equipment in the Russian Empire. American houses represented by German agents should realize this situation.

On the line of the Trans-Siberian Railway, between Petrograd and Vladivostock, are upward of a dozen growing cities of from 50,000 to 75,000 inhabitants. Electric lighting is used in these places on a rather limited scale, service being furnished frequently by municipal plants of small capacity. Within economical transmission radius of about one-half of these cities are potential water-powers which are likely to be developed in the not distant future to supply energy to mining districts or to populous towns which as yet have only begun to appreciate the possibilities of electrical service. Much success has attended the use of steam-power units of the German locomobile type in this part of the Russian Empire. Wood is a common fuel, the cost varying usually from $1.25 a cord along the railway route to about $5 at remote points in the mining district. The superiority of electric power is sure to lead to its wide application as the country develops. Figuring all charges, the cost of electrical energy last year as developed at the busbars of four representative small hydroelectric power plants of the Lena Goldfields Company, Ltd., was about 3 cents per kw-hr.

All through eastern Siberia are mountain ranges with maximum elevations of 3000 ft. to 4000 ft., and streams abound with a winter flow of from 100 second-ft. to 300 second-ft. and a summer flow of ten times these figures. Contrary to the prevailing impression, many parts of Siberia are like southern New Hampshire in scenery and topography. The winters are severe in the extreme, a temperature of — 50 deg. Fahr. being nothing extraordinary.

The Lena Goldfields Company, Ltd., with property 1200 miles north of Irkutsk, operates five small hydroelectric plants of about 500 kw average rating each. Most of these are run the year around, and the present annual output of four stations is about 4,000,000 kw-hr. The usual head is 30 meters. Development with low-head turbines is the proper engineering solution of most Siberian water-power problems. Mr. Purington pointed out that the method of blanketing over canals by ice to give continuous power service in winter, utilized later in the Klondike, has been common in Siberia for many years. In this scheme a temporary dam is built in the canal and the surface allowed to freeze at the beginning of the cold season. The dam is then knocked away, and the water flows under the icy covering without interruption for the rest of the season.

In the Altai Mountains iron, lead and gold mines are being developed by the Irtysch, Russo-Asiatic and Russian Mining corporations, with headquarters in London, Eng., and in the Ural Mountains are large copper mines under development which will require electrical equipment, these being under the control of the Kyschtim, Tunalyk and Sissertsk companies, also of London. American engineers are in the service of these organizations. About 200 miles north of Vladivostock is the Tetuke mine, operated by Brunner, Kuznetsof & Company, which will need electrical equipment in the near future, all the previous equipment having been of German make. On the island of Sakaline, one-half of which belongs to Russia and one-half to Japan, are large coal deposits controlled by the Brunner interests, and the opportunities here for power equipment are good.

Mr. Purington said that the war is taken as a matter of course in the Russian Empire and that it does not stir the emotions found in America. The Russians are waking up to the fact that their importations of electrical and other machinery from Germany have been cut off and that they must look to America and England. The importance of properly packing goods shipped to Siberia and Russia cannot be exaggerated. Mr. Purington said that he had personally imported over $250,000 worth of machinery and supplies into Siberia and that the Singer Sewing Machine and the International Harvester companies appear to be the only American concerns that have learned the secret of adequate packing. Heavier stock should be used in packing boxes, and goods consigned to travel half way around the earth cannot be packed as for a trip across the street. Drills imported from Holland are packed like jewelry, while American drills, a product more suited to the needs of the mines, were packed with insufficient care.

A reasonable way of shipping from America would be from San Francisco or Portland, Ore., by direct lines to Vladivostock, or to Vladivostock from New York and through the Panama Canal. The freight rate from New York to Libau or Windau by the transatlantic boats and thence to Irkutsk by rail is about $48 a ton, and from Portland, Ore., to Irkutsk via Kobe, is about $51 per ton. Northern Siberia will be developed greatly in the next half century and all-water shipments from Hull, Eng., to Krasnoyarsk via Nova Zembla and the Yenesei River are now rated at $20 per ton, the trade route being kept open a part of the year by ice breakers. Along the Amur River great lumber developments are under way, with a market for power-driven machinery. In conclusion, Mr. Purington said that there are possibilities in the way of electric irrigation in Russian Turkestan and urged the importance of investigating by personal visits from Americans.

NEW YORK METAL MARKET PRICES

	Jan. 12 Selling Prices Bid	Jan. 12 Selling Prices Asked	Jan. 19 Selling Prices Bid	Jan. 19 Selling Prices Asked
Copper:	£ s d		£ s d	
London, standard spot*	59 15 0		60 15 0	
Prime Lake	13.62½	to 13.75	13.75	to 14.00
Electrolytic	13.50	to 13.60	13.65	to 13.75
Casting	13.35	to 13.45	13.50	to 13.60
Copper wire base	14.62½	to 14.75	.....	to 15.00
Lead	3.70		3.70	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	9.00		9.00	
Spelter, spot	6.10	to	6.25	to 6.30
Straits tin	33.50		33.87½	
Aluminum, 98 to 99 per cent	18.75	to 19.25	18.75	to 19.25

*OLD METALS

Heavy copper and wire	12.00	12.25
Brass, heavy	8.62½	8.75
Brass, light	7.50	7.62½
Lead, heavy	3.62½	3.52½
Zinc, scrap	4.62½	4.75

COPPER EXPORTS

Exports of copper in form of pigs, ingots, bars, plates, and scrap for week ending Jan. 9, 1915 ..... 16,884,783 lb.

*From daily transactions on the New York Metal Exchange.

New Incorporations

The Electric Light & Power Company, of Stratford, Ia., has been chartered with a capital stock of $10,000 by O. T. Quick and V. Lander.

The Boulevard Light & Heat Company, of Cleveland, Ohio, has been incorporated with a capital stock of $1,250 by G. B. Harris and others.

The Wolfe City Light Company, of Wolfe City, Tex., has been granted a charter with a capital stock of $6,000. The incorporators are M. Tasker, Edward Tasker and Frank T. Becker.

The Brown & Harris Electric Company, of Holmesville, Ohio, has been incorporated with a capital stock of $3,500 to construct and operate an electric-lighting plant in Holmesville. The incorporators are S. C. Brown, J. B. Harris, B. C. Brown and B. E. Cleary.

The Altos Light & Power Company, of White Oaks, N. M., has been incorporated by Allen A. Lane, Edward L. Queen, David L. Jackson and Elmer E. Slaughter. The company is capitalized at $150,000 and proposes to erect a transmission line from the mines at White Oaks to Carrizozo.

The Central Power Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $1,750,000 for the purpose of distributing electricity for lamps, heaters and motors; also to erect power plants, etc. The incorporators are N. P. Coffin, W. J. Maloney and H. L. Mullin, of Wilmington, Del.

New Industrial Companies

The Car Lighting Company, of New York, N. Y., has been chartered with a capital stock of $100,000 by Lloyd O. Wilson, 55 Liberty Street; William H. Black and William P. Horn, New York.

The Witelite Electric Company, of New York, N. Y., has been incorporated with a capital stock of $10.000 by Bernard I. Kambn, 45 Cedar Street; S. S. Ostertag and Max B. Rabinowitz, of New York, N. Y.

The Baker Electric Motor Service Company, of Brooklyn, N. Y., has been incorporated with a capital stock of $20,000 by Frank A. Jannicky, 906 Eastern Parkway, Brooklyn; Frederick Bowers, of New York, and B. R. Shears, of Brooklyn.

Edward T. Caldwell & Company, of New York, N. Y., have been incorporated with a capital stock of $150,000 to manufacture gas and electric fixtures, ornamental ironwork, etc. The incorporators are E. T. Caldwell, W. Kiehr and L. Livingston, of New York, N. Y.

The Wilson-Maeulin Company, of New York, N. Y., has been chartered with a capital stock of $60,000 by C. E. Wilson, C. H. Wilson, of Mount Vernon, and C. J. Brown, of Jamaica. The company proposes to manufacture electric and scientific instruments, tools, etc.

The Danvers Tungsten Company, of Danvers, Mass., has been incorporated by Charles F. Danvers, Michael H. Barry, of Danvers, and William F. Barry, of Salem. The company is capitalized at $100,000 and proposes to manufacture and sell all kinds of incandescent and electric lamps.

Almirall & Company, of Eddyville, N. Y., have been incorporated by Juan A. Almirall, William C. Adams and Walter J. Wood, of New York, N. Y. The company is capitalized at $200,000 to manufacture heating, ventilating, power and electric plants, plumbing and automatic fire extinguishers.

The Modern Electric & Machine Company, 936 Fort Wayne Avenue, Indianapolis, Ind., has recently been formed, to engage in the electrical, contracting, repairing and manufacturing business. The company repairs motors and generators, rewinds armatures, sells new and used motors, makes switchboards and electric heating devices, and is agent for the Kaestner & Hecht Company, manufacturer of elevators. The plant of the company includes a machine shop for making dies, tools and special machinery. Mr. T. A. Meyer is president, Mr. H. W. Ransdall vice-president, and Mr. L. H. Knue secretary-treasurer.

Trade Publications

Fans.—The Hunter Fan & Motor Company, Fulton, N. Y., has issued a catalog designated as No. 104 which lists a number of electric fans.

Electric Fans.—The Emerson Electric Manufacturing Company, St. Louis, Mo., recently issued its 1915 catalog on fans for both alternating-current and direct-current service.

Battery-Charging Apparatus.—A small automobile battery-charging equipment is described and illustrated in Catalog No. 361 issued by the Esterline Company, Indianapolis, Ind.

Samples of Tapes.—The M. W. Dunton Company, Providence, R. I., is distributing a folder which contains samples of a number of different kinds of tapes for armature and field windings.

Watt-Hour Meters.—The Sangamo Electric Company, Springfield, Ill., is sending out a folder which contains illustrations of some of the large buildings in which its meters have been installed.

Fan-Selling Campaign.—The Western Electric Company, New York, is distributing a folder which contains information on various advertising helps and a prize contest that it has recently inaugurated.

Motor-Driven Siren.—An electrically operated siren designed for sounding fire alarms is the subject of a circular issued by the Hendrie & Bolthoff Manufacturing & Supply Company, Denver, Col.

Lamps for Motion-Picture Studios.—Bulletin No. 57, issued by the Cooper-Hewitt Electric Company, Hoboken, N. J., contains information and illustrations on a number of lighting installations for motion-picture studios.

Composition Gears.—The General Electric Company, Schenectady, N. Y., is distributing a catalog designated as Bulletin No. 48,702, which describes its "Fabroil" gears and contains a number of illustrations of typical installations.

Air Compressors.—The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., is sending out a bulletin designated as Repair-Part Price List No. 1906, which contains information on various types of electrically operated air compressors.

Small Motors.—The Westinghouse Electric & Manufacturing Company has issued a booklet designated as Folder No. 4321 and entitled "Westinghouse Motors," which contains information on a number of applications of small motor drive to machinery.

High-Tension Indoor Equipment.—The Delta-Star Electric Company, Chicago, Ill., is distributing Bulletin No. 15, which comprises eighty pages, contains a total of 188 illustrations, and lists approximately 1200 different types of switches, fuse mountings, choke coils, etc.

Electric Instruments.—The Metropolitan Engineering Company, Brooklyn, N. Y., is sending out several loose leaves to be added to binders which have been previously sent out. These leaves include Section 20, pages 9, 11 and 13, on typical service installations, Section 17, page 2, on direct-current cable-testing ammeters, and Section 11, pages 1-6, on an alternating-current network protector.

Electric Governors.—The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., is sending out Bulletin No. 1091 which contains information on its type OB-4 governor for regulation of pressure for air-brake equipments and air compressors. It is also sending out bulletins designated as Repair-Part Catalogs No. 1903 and No. 1904, which describe and illustrate its types OB, OB-2, OB-3 and OB-4 governors.

Electric Trucks.—The General Vehicle Company, Long Island City, New York, is distributing a booklet entitled "Full of Information," which describes and illustrates a number of different types of electric vehicles for brewery service. The above company has also just issued a catalog entitled "Electric Coal Trucks," and reprints from an article which appeared in the *Electric Railway Journal*, Sept. 5, 1914, entitled "Electric Motor Trucks for New York Railways," and another from the *Dry Goods Economist* of Aug. 22, 1914, entitled, "A Low-Cost System."

Construction News

New England

GREENVILLE, MAINE. — The Public Utilities Commission has granted the Greenville Lt. & Pwr. Co. permission to purchase the property and franchises of the Sangerville Improvement Co., the Sebec Pwr. Co. and the Dover & Foxcroft Lt., Ht.. & Pwr. Co.

BURLINGTON, VT.—The proposal to erect 50 ornamental lamp standards, carrying five-lamp clusters, at a cost of about $5,000, on Church Street, is under consideration. It is proposed to maintain the lamps with underground wires.

RUTLAND, VT.—The Rutland Ry., Lt. & Pwr. Co. has entered into a contract with the Vermont Marble Co., of Proctor, whereby a high-tension transmission line will be erected connecting the Proctor station with the Mendon station of the Rutland company, providing a line for the exchange of power between the two concerns.

GLOUCESTER, MASS.—The Gloucester El. Co. has applied to the Board of Gas and Electric Light Commissioners for permission to issue $95,000 in capital stock, the proceeds to be used to pay for outstanding indebtedness and for further extensions to its plant.

WALTHAM, MASS.—A power plant to furnish light, heat and power to the hospital buildings, a nurses' home and a motor ambulance is recommended by the board of trustees of the Waltham Hospital.

OLNEYVILLE, R. I.—The Town Council has accepted the offer of the Narragansett El. Ltg. Co., of Providence, to replace the present 60-cp street lamps with lamps of 90 cp, at no additional expense to the town.

ROCKVILLE, CONN.—The Rockville Gas & El. Co., it is reported, is contemplating extending its transmission lines from Rockville to Vernon Center to furnish electricity in that section.

Middle Atlantic

BATH, N. Y.—Plans are being prepared by Charles Larrows, engineer-in-charge of the construction of the municipal electric-lighting plant, for installing the new street lamps. The plans provide for 200 lamps. Ornamental lamps will be erected in East Steuben, Liberty and Washington Streets.

CLAVERACK, N. Y.—The Albany Southern R. R. Co., of Hudson, has applied to the Public Service Commission for permission to erect transmission lines in Claverack to supply electrical service here.

COHOES, N. Y.—The Council has engaged V. C. Wynne, of Albany, electrical engineer, to investigate the street-lighting system as well as the advisability of granting the Cohoes Co. a franchise to erect high-tension transmission lines over the streets of the city. A movement has been started to place the lamps on ornamental standards in the business district.

HOLTSVILLE, N. Y.—Nathan Myers,, 39 Hillside Avenue, Newark, N. J., has been engaged as architect for the construction of the first group of buildings to be erected at Holtsville, Long Island, for the Suffolk County Tuberculosis Hospital, consisting of an administration building, two medical buildings, a laundry and power plant and a kitchen building, to cost approximately $50,000. The institution when completed will consist of 15 buildings and will cost about $250,000.

LETCHWORTH VILLAGE, N. Y.—Bids will be received by Frank A. Vanderlip, president of board of managers, Letchworth Village, 55 Wall Street, New York, N. Y., until Jan. 30, for construction of laundry building, including heating, plumbing, electric work and laundry machinery; also for construction of power house, including heating plant and underground piping, plumbing and drainage and electric work at the Letchworth Village, Thiells, N. Y. Drawings and specifications may be obtained at the New York office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Albany. Lewis F. Pilcher, Capitol, Albany, is state architect.

NEW YORK, N. Y.—Bids will be received by Marcus M. Marks, president of the borough of Manhattan, at the offices of the commissioner of public works, Municipal Building, New York, until Jan. 28, for furnishing and installing an electric-lighting system in the Washington Market Building, at Washington, Vesey, Fulton and West Streets, borough of Manhattan. Blank forms, specifications and plans may be obtained at the office of Charles H. Higgins, 30 Church Street, New York.

NEW YORK, N. Y.—Bids will be received by Katherine B. Davis, commissioner of correction, Room 2400, Municipal Building, New York, until Jan. 27 for furnishing material and labor necessary for alterations to the warden's quarters, City Prison (Tombs), separate bids to be submitted, as follows: (A) general construction work; (B) plumbing work; (C) steam-heating work; (D) electric work. Complete copies of plans and specifications and blank forms for proposals may be obtained at the office of F. B. & A. Ware, architects, 1170 Broadway, New York, upon deposit of $5, to be refunded upon return of same.

NEW YORK, N. Y.—Bids will be received by the Board of Trustees of Bellevue and Allied Hospitals Department of New York City, 415 East Twenty-sixth Street, New York, until Jan. 29, for furnishing all labor and materials necessary to reconstruct the existing branch circuits of the electric-lighting systems and furnishing and installing additional gas piping, and furnishing and connecting gas and electric fixtures for the main building of the Harlem Hospital Building, 136th and 137th Streets and Lenox Avenue, borough of Manhattan. Bids will also be received at the same time and place for X-ray plates and tubes as per specification No. 14. Blank forms and further information may be obtained at the office of the contract clerk and auditor, 415 East Twenty-ninth Street, New York.

NORTH TONAWANDA, N. Y.—The Tonawanda Pwr. Co. has applied to the Public Service Commission for approval of its electric franchise and permission to erect a distributing system and exercise said franchise in the town of Pendleton, Niagara County.

SALISBURY CENTER, N. Y.—Plans are being considered for establishing an electric-lighting system in Salisbury Center. The Brooklyn Cooperage Co., it is understood, will supply electricity to operate the proposed system.

SYRACUSE, N. Y.—The Syracuse Park Commission is planning to install a new lighting system in all the large parks.

WATERTOWN, N. Y.—Extensive improvements, it is reported, are contemplated by the Watertown Lt. & Pwr. Co., which include the development of water-power on the Beaver River, for which, it is said, surveys have been made; also to increase the output of the Black River plant to 1000 hp. As soon as the weather permits work will begin on replacing the wooden-pole line between Carthage and the Beaver River development with a new steel-tower transmission line.

WATERTOWN, N. Y.—According to the report submitted by Horace Sweet, engineer, of Utica, the cost of installation of a municipal electric plant for street-lighting would be $109,756. The plans provide for setting the waterwheels in the power house and a new distributing system to maintain the same number of lamps now in use. If the city acquires the present street-lighting system from the Watertown Lt. &. Pwr. Co. under a clause in the existing contract, the cost would be $63,892.

WEEDSPORT, N. Y.—The Public Service Commission has authorized the Empire Gas & El. Lt. Co., of Geneva, to purchase for not more than $19,000 the $15,000 capital stock of the Weedsport El. Lt. Co., of Weedsport. The headquarters of the Empire Gas & El. Co. are in Auburn.

ALLENTOWN, PA.—The board of trustees of the Allentown College for Women has authorized the installation of a lighting and heating system for the new college building now being erected at Cedar Crest, a suburb of this city. Webster Grim is chairman of board.

ALLENTOWN, PA.—Bids will be received by the Lehigh County Commissioners, Allentown, until Feb. 8 for the electrical installation and construction of the new refrigerating plant at the County Home, near Wescosville. R. S. Rathburn, of Allentown, county engineer, is in charge of the work.

ALLENTOWN, PA.—The trustees of the Muhlenberg College contemplate increasing the output of the power plant from 250 hp to 350 hp to supply electricity to the new preparatory school, now being erected on the tract adioining the college. A new generator and other electrical equipment will be required. Dr. J. A. W. Haas is president of Muhlenberg College.

ALLENTOWN, PA.—Bids will be received by the Board of Education, Allentown, until Feb. 10 for electrical equipment and construction, power-plant equipment, heating and ventilating system and vacuum cleaner for the new High School Building in Allentown, now under construction. The cost of the building is estimated at $500,000. Plans and specifications may be obtained at the office of Itunyon & Carey, Newark, N. J., engineers, or at the office of Ruhe & Lange, architects, 12 North Sixth Street, Allentown.

EASTON, PA.—The contract for the construction of St. Joseph's Catholic Church in Easton has been awarded to A. A. Betchel, of Easton. The proposed building will cost $80,000. The plans provide for an elaborate lighting system.

HARRISBURG, PA.—Preparations are being made by Superintendent Rambo to replace the present arc lamps in Capitol Park with incandescent nitrogen lamps of 500 cp and to increase the number from 24 to 30. The lamps will be placed on standards.

BRANCHVILLE, N. J.—The installation of an electric-lighting plant in the almshouse is reported to be under consideration by the Board of Chosen Freeholders.

BALTIMORE, MD.—Plans have been completed by the Department of Lamps and Lighting for extending the ornamental lighting system on North Howard Street. The plans provide for about 30 lamps to be maintained by underground wires.

CUMBERLAND, MD.—The Baltimore & Ohio R. R. Co., it is reported, has awarded the Edison El. Illg. Co., of Cumberland, a contract to supply electricity for lamps and motors for its plant here for a period of ten years.

CUMBERLAND, MD.—The Public Service Commission has authorized the Edison El. Illg. Co., of Cumberland to issue $200,000 in additional capital stock, the proceeds to be used for the acquisition of more property and the construction and maintenance of a larger plant.

North Central

ALMONT, MICH.—The village of Almont has granted the Edison El. Co. of Detroit a franchise to install an electric-lighting system here. The company has taken over the local plant owned by James Bishop, which will be remodeled and new equipment installed.

CADILLAC, MICH.—A committee has been appointed by the Merchants' Association to look into the matter of establishing an ornamental lighting system in the business district.

DETROIT, MICH.—Work, it is reported, will begin at once on the construction of a new substation for the Edison Illg. Co. of Detroit to cost about $125,000, on Congress Street. The initial installation will provide for 5000 kw, which will ultimately be increased to 10,000 kw. The company is also contemplating the construction of a new heating plant to be erected near the substation.

HUDSONVILLE, MICH. — Plans are being considered by B. and T. Hughes to install an electric-lighting plant for their hardware and lumber establishment.

MONROE, MICH.—The River Raisin El. Co., of Monroe, recently granted a franchise to supply electricity in Carleton, is planning to build electric plants at Raisinville and Petersburg. Equipment has not yet been decided upon as the extent of the territory to be covered is yet indefinite. W. H. Knapp, of Monroe, is engineer-in-charge.

RAVENNA, MICH.—A preliminary survey is being made in Rock Creek Valley along the creek from the village of Ravenna to the site of the proposed dam, about 3 miles from the village, by Clifford S. Gamble, former city engineer, of Muskegon. The work is being done under the auspices of the Ravenna Improvement Association.

RIVERDALE, MICH.—Plans, it is reported, are being considered by local business men for the installation of an electric-lighting plant in Riverdale. If the project is carried through, it is proposed to extend the transmission lines to Elm Hall to supply electrical service there and to residents in the rural districts.

BOWLING GREEN, OHIO.—All bids submitted for the erection of a power house for the Bowling Green State Normal College have been rejected by the board of trustees. New bids, it is understood, will be asked.

CINCINNATI, OHIO.—The Cincinnati Gas & El. Co. has submitted certain development plans to the City Council, which if accepted will result in the expenditure of about $15,000,000 by the company within the next 20 years, a large part of which will be expended in the first five years. The proposed work will include the erection of a large power house on the Ohio River to take the place of the present plant on the canal at Plum Street. The estimated cost of the rapid-transit scheme is $14,000,000.

CIRCLEVILLE, OHIO—The Circleville Lt. & Pwr. Co. has applied to the State Public Utilities Commission for permission to issue $250,000 in bonds, of which $70,000 is to be issued at once, the balance to be used for improvements and extensions to its system.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, Cleveland, until Jan. 27 for furnishing and installing two 250-hp water-tube boilers for the City Hospital; also for stokers, bunker and ash hoppers for City Hospital. A. R. Callow is commissioner of purchases and supplies.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, Cleveland, until Jan. 28 for two traveling cranes for the Department of Public Utilities, division of water. Bids will also be received at the same place until Jan. 29 for weatherproof copper wire for the municipal electric-light department. Specifications may be obtained at the office of the commissioner of light and heat division, No. 1443 East Third Street. A. R. Callow is commissioner of purchases and supplies.

HAMILTON, OHIO.—Estimates are being prepared by James O'Toole, superintendent of the municipal electric-light plant, for the West Side Commercial Club relative to the cost of installing ornamental street lamps in that section.

NORWOOD, OHIO.—Incidental to the change of the municipal electric-lighting plant from direct to alternating current several thousand consumers will be forced to make changes in their wiring and equipment in order to utilize the new service. Several of the larger manufacturing plants objected to the change and will install their own generating plants in order to avoid making the change. Of these firms Palm Brothers are one.

ST. CLAIRSVILLE, OHIO.—The Board of Public Affairs has decided to make improvements to the municipal electric-lighting plant. Several proposals have been made by private companies to furnish electricity to the town.

SANDUSKY, OHIO.—Preparations are being made by the Sandusky Gas & El. Co. for the installation of an ornamental street-lighting system, for which it was recently awarded contract by the City Council. The plans provide for the installation of 190 posts carrying two lamps of 250 cp each, 900 lamps of 100 cp and 100 lamps of 60 cp, all of the nitrogen type. The 190 posts are to be maintained by underground wires, the 1000 small lamps by overhead wires. The work will be done by the company. The cost is estimated at about $100,000. E. A. Bechstein is manager.

SHELBY, OHIO.—Improvements, it is reported, are contemplated to the municipal electric-lighting plant.

SPRINGFIELD, OHIO. — Preparations are being made by the Springfield Lt., Ht. & Pwr. Co. and the Western Union Teleg. Co. to place their wires underground in the business section of the city. Wires of the municipal lighting system will soon be placed in conduits for the purpose of maintaining the ornamental street-lighting system which is to be installed. Arrangements are being made by the property owners to install the lamps.

WOODSTOCK, OHIO. — The Village Council has awarded a contract to the Urbana Lt. Co., of Urbana, to furnish electricity for lighting the streets of the village and also for commercial lighting.

YOUNGSTOWN, OHIO.—Bids will be received by Service Director Heasley until Jan. 29 for lighting the streets of the city. The bids will not only include street-lighting, but installing the new system, plans for which have been prepared by H. Whitford Jones, consulting engineer.

ADAIRVILLE, KY.—Plans are being considered, it is reported, to install an electric-lighting plant in Adairville, to replace the acetylene gas plant, which was recently burned.

LOUISVILLE, KY.—The Louisville Gas & El. Co. has submitted a proposal to the Board of Park Commissioners offering to replace the gas lamps now in use on the Western and Southern Parkways and in Cherokee Park with electric lamps. The proposition includes necessary alterations to the present lamp standards and provides for a total of 207 lamps.

ROCKPORT, KY.—The Town Board on Dec. 24 sold a franchise to the Rockport Coal Co. to install an electric-light plant at its works in Rockport.

HAMMOND, IND.—Bids will be received by the Board of Public Works of Hammond until Jan. 27 for building one pump house, furnishing and installing two centrifugal pumps and motors, complete with piping control, panels, etc.

DECATUR, ILL.—Property owners on West Macon Street have petitioned the City Council to install ornamental lamps on that thoroughfare from Union Street to Dennis Avenue.

HOYLETON, ILL.—The Village Board has granted a franchise to William Rixman, of Irvington, to supply electricity in Hoyleton for a period of 20 years. Electricity for operating the system will be supplied by the Nashville El. Lt. Co. A contract was also awarded for lighting the streets of the village with 20 lamps of 100 cp.

MATTOON, ILL.—The State Public Utilities Commission has granted the Central Illinois Pub. Ser. Co., of Mattoon, a certificate of public convenience and necessity to construct and operate a transmission line in McDonough and Fulton Counties. The proposed line will run from Astoria to a point near Bushness, where it will connect with an existing line, and from Table Grove to Ipava.

QUINCY, ILL.—Bids will be received at the office of the Edmund T. Perkins Engineering Co., First National Bank Building, Chicago, until Feb. 19, for furnishing all materials, machinery and labor for the installation of an electrically operated pumping station for the South Quincy Drainage and Levee District, Adams County, Illinois. The work consists of pump house, substation, suction and discharge bays, laying of about 180 ft. of cast-iron pipe, erection of machinery and wiring for machinery and lighting. Bids for pumping machinery will be received as a whole or for each part. The plans call for two centrifugal pumps, equipped with chain drive and necessary auxiliaries, a 5-ton traveling crane, two 200-hp motors and auxiliaries and three 150-kva transformers. Walter P. Martindale is secretary of the commissioners.

SULLIVAN, ILL.—At a special election held recently the proposal to issue $18,000 in bonds was carried.

ODANAH, WIS.—Plans are being considered, it is reported, for the installation of an electric-light plant and telephone system in Odanah.

PRAIRIE DU CHIEN, WIS.—An ornamental street-lighting system covering a distance of 5 miles, it is reported, will be installed here in the spring.

PRESCOTT, WIS.—The City Council, it is reported, has granted the Minnesota, Wisconsin Pwr. Corpn., of Wabasha, a franchise to install an electric-lighting system in Prescott.

GILMAN, IA.—Local business men, it is reported, are contemplating the installation of an electric-lighting plant in Gilman.

WILTON JUNCTION, IA.—The Muscatine Ltg. Co., of Muscatine, has submitted two proposals to the City Council for lighting the city. The first was to extend its transmission line from Moscow to Wilton Junction and to supply energy to operate the municipal electric system; the other was that the company make an appraisal of the municipal plant and take over the property, and build a complete new system. H. C. Blackwell is general manager of the company.

MORRISON, MO.—The installation of a municipal electric-light plant in Morrison is reported to be under consideration.

ST. LOUIS, MO.—The Laclede Gas Lt. Co., of St. Louis, is installing an electric generating plant in St. Louis, on the Iron Mountain railroad to supply electricity for coke ovens now under construction. The equipment will consist of three 500-hp Edge Moor boilers, Link Belt Machinery Co. (pivoted-bucket type) coal-conveying machinery, two Westinghouse turbo-generators (500 kw each), three-phase, four-wire, 60-cycle, 4150-volt (neutral grounded) generator. Transformers, arc lamps and incandescent lamps not yet decided upon. George B. Evans, chief engineer of the company, has charge of the work.

UNIVERSITY, MO.—The proposal to issue $100,000 in bonds for the installation of a municipal electric-lighting system will be submitted to the voters. The project provides for underground conduits.

WEBB CITY, MO.—A new street-lighting system is being installed by the Empire District El. Co., of Webb City, consisting of 30 6.6-amp magnetite, post-type arc lamps, ten suspension-type arc lamps and seven series tungsten lamps, maintained by underground cables. The plans also provide for 85 4.4-amp lamps for future installation.

DRAKE, N. D.—The installation of an electric-lighting system in Drake is under consideration.

MADISON, S. D.—Improvements are contemplated to the municipal electric-light plant, including the installation of a directly connected generating unit, consisting of a 450-hp or 500-hp producer-gas or gas engine and a 350-kw or 400-kw alternating-current generator. Bids will be asked for equipment in the near future. William Rae is city auditor.

BLAIR, NEB.—Plans are being prepared by the Martz Engineering Co., First National Bank Building, Lincoln, for the construction of a municipal electric-light plant in Blair, to cost about $35,000. Bids for construction of the system will be asked for in about 90 days.

OMAHA, NEB.—A bill will be introduced to the State Legislature asking permission for the Omaha Metropolitan Water District to generate and sell electricity, upon the affirmative vote of the citizens of the district, giving the district a full opportunity to compete with private enterprise.

KANSAS CITY, KAN.—An ordinance has been passed by the Board of City Commissioners providing for the installation of electric lamps and water service in St. Margaret Park.

NATOMA, KAN.—The contract for the construction of the proposed municipal electric-light plant, it is reported, has been awarded to the F. D. Martin Construction Co., of Kansas City, Mo. W. B. Collins & Co., of Kansas City, Mo., are engineers.

WILSON, KAN.—Within the next three months the Wilson El. Lt. Co. expects to purchase a steam-driven generating unit (from 50 kw to 125 kw), directly connected; also oil-burning equipment for boilers.

Southern States

COLUMBUS, GA.—The Bibb Mfg. Co., it is reported, will install electrical equipment and make other improvements to its Columbus plant, involving an expenditure of about $75,000.

LANETT, ALA.—The Lanett Cotton Mills expect to purchase within the next three months one 200-kva, three-phase, 60-cycle, 600-volt generator with exciter, switchboard equipment, etc., and 25 watt-hour meters; also to extend the street-lighting system and add about 40 100-cp series street lamps. W. Oscar Orr is superintendent of the electrical department.

NEWPORT, ARK.—Negotiations, it is reported, are under way between the officials of the Arkansas Pwr. Co., of Malvern, and the Co-operative El. Lt. Co., of Newport, whereby the former will take over the property of the local company. If the deal goes through, it is said that improvements will be made to the electric plant and water-works system in Newport.

WINNFIELD, LA.—The Johnson Ice & Lt. Co., of Winnfield, it is reported, is contemplating the installation of an electric-light system, ice factory and cold-storage plant in Winnfield.

DALLAS, TEX.—The Stone & Webster Engineering Corporation, of Boston, Mass., has completed financial arrangements for the construction of extensive terminals for its interurban railway system, including the erection of a passenger station and office building in Dallas, to cost about $2,000,000.

SAN ANGELO, TEX.—The San Angelo St. Ry Co. is contemplating the construction of a new power station and extensions to its railway. J. D. Sugg is owner.

Pacific States

COUPEVILLE, WASH.—A company has been organized in Coupeville for the purpose of constructing an electric power plant (to cost from $25,000 to $30,000) to supply electricity in the town and adjacent territory for lamps and motors. A site for the proposed plant, it is stated, has been selected and work will soon begin on construction of same.

MONTESANO, WASH. — Preparations are being made by the Northwest El. & Water Works, of Montesano, to build an electric power plant on the Chehalis River, 1 mile south of Montesano. The equipment of the proposed plant will consist of one 150-hp and one 175-hp water-tube boiler, one 350-hp and one 250-hp Corliss engine, one 200-kva, one 150-kva and 100-kva, three-phase, 60-cycle, 2200-volt generator, three switchboard panels, one exciter and one feeder. Raymond J. Andrus, vice-president and general manager, will have charge of the construction of station.

SEATTLE, WASH.—The Stone & Webster Engineering Corpn., of Boston, Mass., it is reported, will begin work in the spring on the construction of a large hydroelectric development on the Skagit River, 22 miles above Marblemount.

SEATTLE, WASH.—At a recent meeting the City Council passed the ordinance appropriating $10,000 for the purpose of extending the municipal lighting service to Foster and surrounding territory over the veto of Mayor Gill. If the residents of the outlying districts want to utilize energy generated at the municipal plant Mayor Gill states that they will have to erect transmission lines to the city limits.

MEDFORD, ORE.—The Rogue River Pub. Ser. Corpn., of Grant's Pass, has submitted a proposal to the city of Medford, offering to supply electricity in Medford on a wholesale basis, the city to install and operate the distributing system. If the city of Medford accepts the proposition, it will mean the installation of an additional 2000-kva generating unit at plant of the company at Gold Hill, now under construction. An item was published in the issue of Jan. 2 stating that the Rogue River Pub. Ser. Corpn. had submitted a proposition to the City Council of Grants Pass, which should have been Medford.

MONMOUTH, ORE.—The Council is considering a proposal for improving the street-lighting system submitted by A. L. Martin, local manager of the Oregon Pwr. Co.

OSWEGO, ORE.—The Oswego Lake Wtr., Lt. & Pwr. Co., recently incorporated with a capital stock of $5,000, proposes to install a power plant and furnish water to the city of Oswego. The incorporators are A. S. Pattullo, Frederick H. Strong and Isaac D. Hunt, all of Portland.

SALEM, ORE.—The installation of a municipal electric-lighting plant in Salem is under consideration. According to estimates prepared the cost would be from $200,000 to $250,000.

SILVERTON, ORE.—The Portland Ry., Lt. & Pwr. Co., of Portland, has notified the City Council that it is ready to enter into negotiations relative to the installation of a new street-lighting system in Silverton.

AUBURN, CAL.—Preparations are being made by the Pacific Gas & El. Co., of San Francisco, to resume work on its tower line between its No. 4 and No. 5 power houses. The power houses are between 4 and 5 miles apart, and ditches are to be dug to carry the head water from Lake Spaulding through the two plants. The power stations are also to be constructed. The towers are to be 80 ft. high.

YREKA, CAL.—The franchise recently sold by the Board of Supervisors was purchased by the California-Oregon Pwr. Co. for the purpose of extending its transmission lines from Castella to the Coffee Creek mining district, a distance of about 25 miles. The company proposes to supply electricity to the mines and dredgers in the Coffee Creek district and also to the towns of Carrville and Trinity Center.

FAIRVIEW, MONT.—Application has been made to the City Council by C. W. Jenison, of Fairview, for a 30-year franchise to construct and operate an electric light and power plant here.

PLENTYWOOD, MONT.—A company is being formed by local business men to take over the local electric-light plant and water-works system. It is proposed to enlarge the plant and extend the transmission lines into the surrounding territory.

Canada

YMIR, B. C.—The company operating the Yankee Girl Mine, it is reported, is contemplating the construction of a hydroelectric plant at Wild Horse Creek. Sufficient power could be developed for the company's requirements and for lighting the town of Ymir.

BOTHWELL, ONT.—The by-law authorizing the authorities to enter into a contract with the Hydro-Electric Power Commission for hydroelectric power was approved by the ratepayers.

DUNDALK, ONT.—At an election held Jan. 4 the by-law authorizing an expenditure of $5,000 for the installation of a distribution system to utilize energy to be supplied by the Hydro-Electric Power Commission was carried.

LONDON, ONT.—Estimates have been prepared by the Hydro-Electric Power Commission of Ontario for the construction of an electric railway from London to Tillsonburg. The cost is placed at $892,000. W. W. Pope, Continental Life Building, Toronto, is secretary of the commission.

ST. MARY'S, ONT.—The purchase of a gas engine for the municipal water and light plant is reported to be under consideration by the Water and Light Board.

ST. MARY'S, ONT.—Estimates have been prepared by the secretary of the Water, Light and Heat Commission of the cost of erecting a transmission line from St. Mary's to Rannock. The cost is estimated at $20,000 per mile, including poles, wires, etc.

SHELBURNE, ONT.—At an election recently a by-law authorizing an expenditure of $15,000 for the installation of an electric distributing system was carried.

TORONTO, ONT.—Plans are being prepared to extend the hydro street-lighting system of Toronto to Scarlett Plains and Lambton Park.

TORONTO, ONT.—Plans have been completed by the Canadian Electrical Association for co-operative purchasing by its member companies. The association is in the market for a large quantity of carbon and tungsten lamps, meters, transformers and rubber-covered and weather-proof wire. The purchasers will all be operating companies in good standing and will include the largest organizations in Canada. Specifications, etc., may be secured upon application to Alan Sullivan, secretary and treasurer, 10 Adelaide Street, Toronto.

WALLACEBURG, ONT.—At an election held recently the by-law authorizing the Town Council to appropriate $9,000 for hydroelectric water-works was carried.

WELLAND, ONT.—At an election held recently the by-law providing $5,000 for the installation of a fire-alarm system was carried.

ROBERVAL, QUE.—Debentures to the amount of $45,000 will be issued by the city of Roberval for the installation of an electric-lighting system.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Jan. 29, for steel cable, sheet brass, etc. Blanks and general information pertaining to the circular (No. 894) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is purchasing agent.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JAN. 5, 1915.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,123,225. ELECTRIC RESISTANCE DEVICE AND MEANS FOR REGULATING THE SAME; G. E. Bernecker, Chicago, Ill. App. filed Oct. 31, 1911. Heating coil zig-zagged through openings in flat insulating base.

1,123,248. TRANSFORMER FOR USE WITH CURRENT-RECTIFYING APPARATUS; F. Conrad, Swissvale, Pa. App. filed April 10, 1908. Auxiliary devices are dispensed with.

1,123,251. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed Nov. 17, 1911. Battery charging.

1,123,255. CIRCUIT INTERRUPTER; H. P. Davis, Pittsburgh, and C. Aalborg, Wilkinsburg, Pa. App. filed June 25, 1906. Designed for outdoor service.

1,123,264. SAFETY DEVICE FOR MARINE ENGINES; G. C. Ellerton, United States Navy. App. filed Dec. 27, 1910. Warning device sounds whenever engineer fails to obey the signals he receives.

1,123,267. GATHERING LOCOMOTIVE WITH HAULAGE MECHANISM; D. T. Fisher, Columbus, Ohio. App. filed March 17, 1909. Has a conducting cable which can be used for haulage purposes.

1,123,275. REGULATING SWITCH FOR STORAGE BATTERIES; J. H. Gulger and M. Lindem, Milwaukee, Wis. App. filed Nov. 11, 1911. For regulating the charging of the end cells.

1,123,277. THERMOSTATIC REGULATING DEVICE; E. Haagn, Hanau-on-the-Main, Germany. App. filed Jan. 16, 1914. Circuit-closer rocks on projection of the two thermostatic elements.

1,123,282. CIRCUIT INTERRUPTER; F. W. Harris, Wilkinsburg, Pa. App. filed Oct. 5, 1907. Operates by predetermined successive movements.

1,123,283. SYSTEM OF ELECTRIC DISTRIBUTION AND CIRCUIT CONTROL; F. W. Harris, Wilkinsburg, Pa. App. filed Oct. 7, 1908. Circuit interrupter with visual indicators.

1,123,288. AUTOMATIC CIRCUIT-BREAKER; R. E. Hellmund, Hinsdale, Ill. App. filed Jan. 16, 1905. Operates tardily upon certain current conditions and instantly under other conditions.

1,123,299. PROCESS OF ELECTROLYTIC DEPOSITION OF METALS FROM SOLUTIONS; N. V. Hybinette, Christiania, Norway. App. filed May 22, 1913. Electrolyzing copper solutions containing iron.

1,123,305. HIGH-SPEED RAILROAD; T. L. Johnson (deceased), Cleveland, Ohio. App. filed April 20, 1905. Magnetic propulsion.

1,123,306. HIGH-SPEED RAILWAY; T. L. Johnson (deceased), Cleveland, Ohio. App. filed Aug. 23, 1905. Decreases normal friction by developing an upward lift.

1,123,307. SYNCHRONOUS RECTIFIER; C. H. Kicklighter, Newberry, S. C. App. filed Aug. 25, 1909. Polyphase alternating current converted into direct current, with sparkless commutation.

1,123,308. METHOD OF ELECTRIC WELDING; C. H. Kicklighter, Atlanta, Ga. App. filed Jan. 26, 1914. An intermediate metal is softened and forced into grooves in the welded bodies.

1,123,309. METHOD OF ELECTRIC WELDING; C. H. Kicklighter, Atlanta, Ga. App. filed Aug. 29, 1914. Pressure and heating current employed to force the intermediate metal into grooves.

1,123,319. DYNAMO-ELECTRIC MACHINE; F. R. Kunkel, Edgewood Park, Pa. App. filed Dec. 29, 1909. Core and frame structure of fan motor.

1,123,321. METHOD OF OPERATING POLYPHASE INDUCTION MOTORS; B. G. Lamme, Pittsburgh, Pa. App. filed July 6, 1908. Obviates necessity for auto-transformers.

1,123,339. TELEPHONE EXCHANGE SYSTEM; T. G. Martin, Chicago, Ill. App. filed June 16, 1906. Automatic or semi-automatic party-line system.

1,123,340. TELEPHONE EXCHANGE SYSTEM; F. R. McBerty, Antwerp, Belgium. App. filed Aug. 21, 1913. Test or controlling circuit for systems utilizing automatic switches.

1,123,341. ELECTRICAL CONTROL SYSTEM; W. N. McComb, New York, N. Y. App. filed June 5, 1911. Thermal sign flasher.

1,123,343. ELECTROMAGNETIC RAIL BRAKE; G. Mertens, Dresden, Germany. App. filed July 31, 1912. Braking effect is increased without increasing the number of the poles.

1,123,370. VOLTAIC BODY BATTERY; A. A. Pratt, Los Angeles, Cal. App. filed Aug. 4, 1913. Different metals secured in face of disk of insulation.

1,123,373. ELECTRIC CIRCUIT CONTROLLER; F. Ptok, Munich, Germany. App. filed Sept. 23, 1913. Make-and-break mechanism for flashing signs.

1,123,380. RADIATOR; F. T. Riley, Kansas City, Mo. App. filed May 11, 1914. For autos; has electric heater controlled by thermostat.

1,123,381. TELEWRITER APPARATUS; F. Ritchie, Acton, England. App. filed Dec. 10,1910. Paper-shifting details.

1,123,384. INCANDESCENT ELECTRIC LAMP; J. J. Rooney, New York, N. Y. App. filed Jan. 5, 1910. Turn-down lamp operated by pull.

1,123,393. BURGLAR ALARM; J. A. G. Schmiedeberg, Hamburg, Germany. App. filed April 6, 1914. Readily portable.

1,123,411. ELECTROMAGNETIC POWER DEVICE; A. K. T. Smith and P. Good, London, Eng. App. filed April 29, 1911. Especially for operating railway points, signals, etc.

1,123,413. ELECTRIC SWITCH; J. C. Smith, Louisville, Ky. App. filed July 31, 1911. For reducing speed of elevator at predetermined point.

1,123,436. OPERATING MECHANISM FOR OSCILLATORY IGNITION MACHINE; R. Wagner, Stuttgart, Germany. App. filed Dec. 16, 1912. Mechanical details of operating lever and cam.

1,123,448. IGNITION SYSTEM; P. R. Werner, Philadelphia, Pa. App. filed Aug. 25, 1911. Novel contact mechanism, means for short-circuiting and spark control.

1,123,452. ELECTROMAGNETIC SWITCHING SYSTEM; L. L. White, Dorris, Cal. App. filed Nov. 4, 1912. Thermostatically controlled.

1,123,476. TELEPHONE SYSTEM; O. Brisbois, Chicago, Ill. App. filed Jan. 7, 1913. Prepay or coin box is used.

1,123,484. CONTROLLER FOR ELECTRIC CIRCUITS; C. H. Carter, Colon, Panama. App. filed Feb. 15, 1908. Pull switch controlling a plurality of circuits.

1,123,491. POWER-CONVERSION PLANT; E. A. Corbin, Philadelphia, Pa. App. filed

May 12, 1913. Adapted for submergence in rapids, eddies, etc.

1,123,506. TELEPHONE EXCHANGE APPARATUS AND SYSTEM; J. Erickson, Chicago, Ill. App. filed July 31, 1906. Improved means for relaying switch-operating impulses from one section of a line circuit to another.

1,123,520. ELECTRIC LAUNDRY IRON; M. K. Golden, Detroit, Mich. App. filed July 6, 1914. Made of sheet metal with heating wire embedded in body sand therein.

1,123,543. ELECTRIC-CURRENT COLLECTOR; T. B. Janssen, Münster, Germany. App. filed March 27, 1914. Automatic adjustment.

1,123,551. OVERHEAD TROLLEY APPARATUS; W. H. Kempton, Mansfield, Ohio. App. filed Feb. 26, 1912. Improved trolley frog.

1,123,558. ELECTRIC WELDING APPARATUS; L. S. Lachman, New York, N. Y. App. filed April 18, 1914. For spot welding.

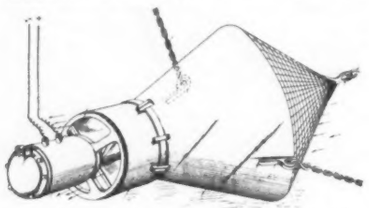
1,123,614. AUTOMATIC FIRE ALARM; A. L. Stewart, L. O. Hawkins and A. E. Mosher, Madera, Pa. App. filed Oct. 25, 1913. Embodies an inflammable strip.

1,123,621. ELECTRIC IGNITION SYSTEM; J. A. Struthers, Jersey City, N. J. App. filed March 10, 1913. Motor for cranking, capable of operating as regular ignition magneto.

1,123,624. METHOD FOR ELECTRIC SEAM WELDING; E. Thomson, Swampscott, Mass. App. filed May 10, 1913. Avoids buckling in spot-welding operation.

1,123,625. GLOWER FOR ELECTRICAL INCANDESCENT LAMPS; O. M. Throwless, Newark, N. J. App. filed Jan. 20, 1911. Employs tungsten vapor and dry hydrogen.

1,123,626. ELECTRICAL SYSTEM OF DISTRIBUTION; W. A. Turbayne, Lancaster, N. Y. App. filed Oct. 16, 1908. Battery booster.



1,123,491—Power-Conversion Plant

1,123,629. DRIP-PAN ALARM; G. R. Waid, Pegram, Idaho. App. filed Jan. 26, 1912. Adapted to be placed beneath an ordinary refrigerator.

1,123,631. SPARKING PLUG; T. M. and G. T. Wayman, Pittsburgh, Pa. App. filed March 1, 1913. Has pneumatically operated movable electrode.

1,123,654. TELEPHONE-RECEIVER ATTACHMENT; G. J. Arfsten, Denver, Col. App. filed April 20, 1914. Pads of sanitary paper from which sheets can be torn.

1,123,677. LIMITER AND INTERRUPTER FOR ALTERNATING ELECTRIC CURRENTS; A. W. Burke, Wilkinsburg, Pa. App. filed March 11, 1912. Special transformer construction.

1,123,683. PROCESS FOR EXTRACTING METALS FROM LIVING BODIES; T. M. Clague, Newcastle-upon-Tyne, Eng. App. filed Sept. 20, 1913. Passes current through the body.

1,123,695. MULTIPLE BRUSH SELECTOR; E. B. Craft and J. N. Reynolds, Hackensack, N. J. App. filed Nov. 29, 1912. Improved mounting for the brush sets.

1,123,696. MULTIPLE BRUSH SELECTOR; E. B. Craft and J. N. Reynolds, Hackensack, N. J. App. filed Nov. 29, 1912. Improved means whereby activity of the brush sets is selectively controlled.

1,123,703. CARBON ASSORTING DEVICE; A. M. de Jeu, Cleveland, Ohio. App. filed June 19, 1912. For assorting straight carbons from bent carbons.

1,123,706. MULTIPLE BRUSH SELECTOR; S. F. Dixon, Newark, N. J. App. filed Nov. 29, 1912. For automatic or semi-automatic telephone system.

1,123,722. GAS CONTROLLING AND IGNITING APPARATUS; E. N. and E. A. Frary, South Deerfield, Mass. App. filed June 16, 1910. For automobile gas lamps.

1,123,734. TELEPHONE CALL RECORDER; J. K. Guthrie, Perth Road, Ontario, Canada. App. filed May 11, 1914. For attachment to "desk" telephones.

1,123,756. ELECTRIC ACCUMULATOR; H. A. Kinney, Lansing, Mich. App. filed Sept. 29, 1913. Electrolyte can be replaced without deranging plates.

1,123,758. ELECTRIC SWITCH; O. M. Knoblock, South Bend, Ind. App. filed Dec. 11, 1913. Has plunger which can be shifted to complete several different circuits.

1,123,789. ELECTRIC-HEATING ELEMENT; R. J. M. Parke and E. D. Brand, Toronto, Ontario, Canada. App. filed Dec. 11, 1913. Resistance is coiled through notches of a metal spider.

1,123,799. MULTIPLE BRUSH SELECTOR; J. N. Reynolds, Greenwich, Conn. App. filed Nov. 16, 1912. Adapted for use either as a selector or a connector.

1,123,809. CIRCUIT-BREAKER TRIPPING APPARATUS; W. M. Scott, Radnor, Pa. App. filed June 23, 1913. Acts upon change phase relation.

1,123,818. ELECTRIC BELL; F. S. Tucker, Boston, Mass. App. filed Feb. 6, 1914. Improved striker mechanism.

1,123,826. TELEPHONE SYSTEM; H. G. Webster, Chicago, Ill. App. filed Sept. 20, 1906. Improved means for connecting subscribers' line to an idle link circuit.

1,123,829. CIRCUIT SWITCH; J. C. Wrasse, Mishawaka, Ind. App. filed Oct. 30, 1913. Prevents flickering of lights caused by surge of current.

1,123,843. DEPOLARIZER FOR GALVANIC CELLS; P. Burger, Berlin, Germany. App. filed July 2, 1913. Manganese dioxide and acetylene soot.

1,123,855. ELECTROMAGNETIC MEASURING INSTRUMENT; W. J. Davis, Enfield, Eng. App. filed June 20, 1913. Extra damping chamber is provided.

1,123,870. SWITCH; B. Haskins, Milwaukee, Wis. App. filed Feb. 4, 1910. Oil switch.

1,123,909. TELEPHONE SHEATH; O. W. Messimer, New York, N. Y. App. filed May 4, 1912. Leather cover for "desk" telephone.

1,123,910. INTERFERENCE PREVENTER FOR USE IN WIRELESS-TELEGRAPH SYSTEMS; T. B. Miller and A. H. Cox, Seattle, Wash. App. filed Nov. 16, 1912. Lubricated contact between metal electrodes.

1,123,925. TRAFFIC GUIDES; R. W. Roderick, Akron, Ohio. App. filed Jan. 27, 1914. Operated by crossing policeman to regulate traffic.

1,123,926. ELECTRICAL SWITCH-THROWING MECHANISM; J. S. Ross, Altoona, Pa. App. filed June 28, 1910. Controlled by the motorman.

1,123,931. MACHINE FOR MAKING WELDED CHAINS; M. B. Ryan, Boston, Mass. App. filed Nov. 3, 1909. Welded portions are subjected to pressure.

1,123,942. STEREOSCOPIC X-RAY SYSTEM; H. C. Snook, Cynwyd, and E. W. Kelly, Philadelphia, Pa. App. filed Aug. 15, 1912. X-ray tubes brought alternately into circuit with transformer secondary.

1,123,962. PROCESS OF HYDROGENATING FATS AND OILS AND WAXES; T. E. Walker, Austin, Tex. App. filed May 22, 1913. Subjected to heat, hydrogen and catalyzing agent in presence of electrical discharge.

1,123,971. DISTRIBUTER FOR IGNITION DYNAMOS; H. H. Wixon, Chicago, Ill. App. filed March 4, 1910. Rotatable spark-gap in parallel with the spark plugs.

1,123,979. TELEPHONE ATTACHMENT FOR CARS; M. J. Bartol, Beaverdale, Pa. App. filed March 17, 1914. Live wires along track engaged by shoes in car.

1,123,985. INSULATING MATERIAL; F. Bolling, Oberursel, Germany. App. filed May 31, 1913. Mica flakes pasted together.

1,124,003. ELECTRIC LOCOMOTIVE WITH CABLE-REELING MECHANISM; D. T. Fisher, Columbus, Ohio. App. filed July 22, 1911. Has drum for collector cable and drum for haulage cable.

1,124,021. IMPULSE TRANSMITTER; W. F. Hoffmann, Springfield, Ohio. App. filed May 26, 1911. For automatic telephone system.

1,124,022. IGNITION FOR MULTIPLE-CYLINDER COMBUSTION ENGINES HAVING IRREGULAR ORDER OF IGNITION; G. Honold, Stuttgart, Germany. App. filed Sept. 27, 1910. Special ignition system.

1,124,023. ELECTRIC IGNITION SYSTEM; G. Honold, Stuttgart, Germany. App. filed Sept. 21, 1911. Includes a mechanical interrupter and a buzzer, but no battery.

1,124,055. ELECTRIC WATER-LEVEL INDICATOR; W. E. Morefield and A. J. Brady, Hinton, W. Va. App. filed April 6, 1912. Indicators at the different levels are successively cut out or in as the water rises or falls.

1,124,060. TEST GUARD FOR AUTOMATIC SWITCHING APPARATUS; J. N. Reynolds, Greenwich, Conn. App. filed Aug. 18, 1913. Each line is caused to test busy while in use.

1,124,068. APPARATUS FOR MEASURING THE INCLINATION OF BORE HOLES AND MAKING A PHOTOGRAPHIC RECORD THEREOF; H. M. Smitt, Utrecht, Netherlands. App. filed Sept. 24, 1913. Gyroscope prevents rotation of the level.

1,124,072. ELECTROMAGNETIC TRACK BRAKE; D. Storjohann, Immigrath, Germany. App. filed July 30, 1914. Adjusts itself to occasional irregularities in the rails.

1,124,075. ELECTRIC POCKET LAMP; J. G. Swallow, New York, N. Y. App. filed Sept. 4, 1913. Has a pivoted lamp carrier by which direction of beam is controlled and lamp is switched on and off.

1,124,086. CONTROLLING MEANS FOR ELECTRIC MOTORS; G. H. Whittingham and W. T. Holmes, Pikesville and Baltimore, Md. App. filed March 27, 1911. Control of motors for driving reciprocating beds of printing presses, etc.

1,124,105. IMPULSE TRANSMITTER; W. M. Bruce, Jr., Urbana, Ohio. App. filed Dec. 7, 1911. Calling device for automatic telephones.

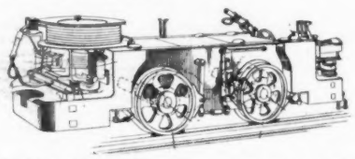
1,124,119. TELEGRAPH INSTRUMENT; H. A. Emrick Casey, Ill. App. filed Aug. 1, 1913. Employs the main key to transmit "dashes" and sends "dots" by a supplemental key.

1,124,129. MEANS FOR REGULATING CLOCKS BY HERTZIAN WAVES; G. A. Goodson, Minneapolis, Minn. App. filed Feb. 21, 1910. Has time-controlled means for starting the gas engine which drives the generator.

1,124,133. SAFETY FUSE FOR ELECTRIC CIRCUITS; H. C. Hershey, Hanover, Pa. App. filed Jan. 25, 1913. Can be renewed with a fuse member of the same capacity.

1,124,137. DIAPHRAGM HORN; M. R. Hutchinson, Deal Beach, N. J. App. filed Oct. 26, 1909. Rotary actuator is yieldingly sustained against diaphragm.

1,124,142. SPEED-DEPENDENT MOTOR-CONTROLLING APPARATUS; S. H. Keefer (deceased), Plainfield, N. J. App. filed May 29, 1911. Motor circuit opened when current in armature or field exceeds predetermined amounts.



1,124,003—Electric Locomotive with Cable-Reeling Mechanism

1,124,169. BURGLAR ALARM FOR SAFES; T. Prushey, Tacoma, Wash. App. filed Aug. 16, 1911. Safe walls charged with compressed air.

1,124,179. CIRCUIT-BREAKER TRIPPING APPARATUS; W. M. Scott, Radnor, Pa. App. filed July 12, 1913. Operated on charge in phase relations.

1,124,189. MOTOR-CONTROL SYSTEM; G. H. Whittingham, Bancroft Park, Md. App. filed Aug. 28, 1912. Reverses motor by reversing current in armature circuit while armature is running at normal speed.

1,124,192. ELECTROMAGNETIC SELECTING APPARATUS; G. L. Anders, Sydenham, London, Eng. App. filed Nov. 7, 1907. Has a plurality of electromagnets and a universally movable armature in common.

1,124,194. FUSE; W. C. Banks, New York, N. Y. App. filed March 11, 1913. Renewable cartridge fuse construction.

1,124,211. ELECTRIC LOCOMOTIVE; F. C. Coseo, Columbus, Ohio. App. filed July 29, 1911. Has improved winding mechanism with drum for conductor cable and drum for haulage cable.

1,124,213. INCANDESCENT ELECTRIC LAMP; H. Csanyi, New York, N. Y. App. filed Nov. 3, 1913. Miner's lamp; upon breakage of lens the lamp circuit is opened.

1,124,215. ILLUMINATING AND SOUNDING SIGN OR INDICATOR; J. A. Dempsey, New York, N. Y. App. filed July 2, 1913. Clock for "Elks'" ceremony.

1,124,230. ELECTRIC FUSIBLE CUT-OUT; H. P. Liversidge, Bala, Pa. App. filed April 9, 1913. Expulsion type; gas is released to blow out arc.

13,858 (reissue). APPARATUS FOR TESTING STORAGE-BATTERY CIRCUITS; C. E. Beach, Binghamton, N. Y. App. filed Oct. 26, 1914. (Original patent No. 1,099,909, dated June 16, 1914.) Measuring instruments may be connected for testing and are duly protected during such testing.

13,861 (reissue). MANUFACTURE OF STEEL; W. R. Walker, New York, N. Y. App. filed Oct. 8, 1914 (Original patent No. 1,014,425, dated Jan. 9, 1912.) Removes carbon of pig iron, recarburizes and then treats in electric furnace.